Vol. 191 82nd Year No. 3504

THE GAS JOURNAL

JULY 16, 1930

A Glance at the Contents—

Gas v. Electricity.

The relative places of gas and electricity in industrial heating are discussed by Sir Robert A. Hadfield, Bart., and Mr. R. J. Sarjant.

Statistics of the Industry.

Useful statistics relating to our industry are given by Mr. T. P. Ridley, who discusses the effect of public control on the economic operation of gas undertakings and upon the economic relations between consumer and supplier.

Education in Our Industry.

Sir Francis Goodenough, C.B.E., discusses the training of gas technicians, with special reference to the Education Scheme of the Institution of Gas Engineers, which, he observes, will ultimately exercise a great beneficial influence on the industry.

Design and Operation of Gas Appliances.

The work of the Joint Research Committee of the Institution of Gas Engineers and the University of Leeds on the problems of design, construction, operation, and testing of domestic gas-heating equipment is dealt with by Mr. J. W. Wood and Mr. G. B. Howarth.

Correspondence Classes.

Sir Francis Goodenough, C.B.E., Mr. J. Mogford, and Mr. Arthur Coe give us their views on this important question. The subject of postal tuition in gas salesmanship is to be discussed by the Executive Committee of the British Commercial Gas Association at their meeting to-day. In regard to correspondence classes for students in gas engineering or gas supply, this matter will form the subject of special consideration at the next meeting of the Gas Education Committee of the Institution of Gas Engineers.

Superintendent Required for Granton Works.

Applications are invited for the position of Superintendent at the Granton Works of the Edinburgh Gas Department. Applicants should be not over 40 years of age; they must have occupied a similar position in a large works, and also be Members or Associate Members of the Institution of Gas Engineers, and hold the Diploma of that Institution or the Technological Certificate of the City and Guilds of London Institute. The commencing salary will be at the rate of £600 per annum, with free residence, fuel, and light at the works.

Benzole Extraction.

It is pointed out by Mr. H. Hollings that the adoption of benzole extraction by an undertaking making only coal gas represents an increase in business which, expressed upon a thermal basis, is equivalent to an increase in gas sales of about 6 p.ct. In the case of an undertaking making a mixture of coal gas and water gas, the increase is slightly less. This increased business continues uniformly day and night and may be terminated at the convenience of the undertaking without regard to any statutory obligation to a gas consumer.

Disposal of Effluent Liquors.

Dr. A. C. Monkhouse summarizes present knowledge on this problem.

National Gas Council Executive Board.

A meeting of the National Gas Council Central Executive Board was held at 28, Grosvenor Gardens, S.W. 1, on Tuesday, July 8, when many important matters were discussed. Mr. Shapley gave a report of the work which was being done by a small Committee which he had appointed of representatives in the West Riding of Yorkshire District to consider the gas charges position in relation to the unremunerative consumer. Other matters dealt with include the Area Gas Supply Committee, Rating Assessment, the World Power Conference, and various Parliamentary items.

Selling Gas to Industry.

In a paper on the methods of encouraging the use of gas in industry, Mr. E. A. Leask, who outlines what is being done by the Leeds Gas Department, emphasizes the need for industrial salesmen with a sound engineering training. Salesmen, he says, should know the details of the various industrial operations, so that when they approach a prospective customer, they may be in a position to talk his language. He remarks that the demonstration department is an essential feature of the work, and that upon this section the success of the business very largely depends.

Mains and Cables in Highways.

Dealing with this subject, Mr. Stephen Lacey states that his experience in regard to the relative cost of laying and maintaining gas mains in subways and in the sub-soil of roads is that the actual saving, if any, is small, and certainly insufficient to pay the annual charges on the capital expenditure on the subway. He concludes that the cost of building pipe subways in existing roads is, generally speaking, prohibitive, and he considers that the provision of ample width of footway is the most promising line for improvement in the accommodation of mains and cables in future roads.

Residuals Markets and the Cost of Gas Production.

The bearing of fluctuations in the price of coke and by-products on the cost of production of gas is considered by Mr. M. Barash. He observes that a variation of 1s. in the selling price of coke per ton affects the cost of gas production to the extent of 3 to 4 p.ct.; as a fairly normal fluctuation is of the order of 5s. per ton, this one item would account for a variation of from 15 to 20 p.ct. in the cost of gas production. On the question of benzole extraction, the author says that, taking into consideration the cost of debenzolizing plant and the working costs of the process as against the enriching effect which this benzole has on the cheap water gas present in the mixed coal gas, as well as other advantages of allowing it to remain in the gas, it is evident that the recovery of benzole is not a paying proposition in the gas industry.

EDITORIAL NOTES

The Berlin Conference

To a large extent this issue of the "JOURNAL" is devoted to a review of the proceedings at the Second Plenary World Power Conference, which took place in Berlin last month, and to summaries of those of the 400 or so papers submitted which are of closest concern to the gas industry. A "bird's-eye view" of such a gathering is practically impossible, and so particular aspects are likely to influence opinion as to the precise degree of success achieved. For ourselves, we feel strongly that the conference would have been well worth while had it accomplished nothing more than the bringing together of so many people of different nationalities. As with persons, so it is with nations—nothing can be more helpful towards improved understanding than personal contact. Thus the causes of science and of humanity are on parallel lines.

But the conference must have accomplished far more than this, having in mind the completeness of the arrangements, upon which those responsible had been actively engaged for at least two years. The getting together of about 4000 experts from every part of the world, to discuss problems in which all are interested, is an achievement upon which the International Executive Council and the National Committees may fairly look to be congratulated. Enormous labour must have been involved in collecting the matter contained in the 400 papers in 34 General Reports—each printed in the three official languages of the conference (German, English, and French), and containing a brief abstract of each paper dealt with by the report, a short summary of the trend of development as indicated by the papers, and points suggested for discussion. The greatest number of persons at a technical meeting was somewhat over 1200, and the speakers in individual discussions averaged more than a dozen. Thanks to the saving of time by the speech transmitting apparatus, which permitted the remarks made to be heard in any one of three languages at the same time, 430 persons were enabled to take part in the discussions. It is understood that the practical test to which this intriguing Siemens and Halske apparatus was subjected has resulted in numerous valuable suggestions for its improvement.

It would be a great pity if so much activity as has been aroused by this conference should cease until the approach of the time for the next meeting, and, in fact, there appears to be no likelihood of its doing so. We are informed that the International Executive Council have appointed a Sub-Committee to examine, after they have been circulated to all the National Committees, the series of important resolutions which were passed at the technical sessions, and to make recommendations to the next meeting of the International Executive Council in 1931, when they will be thoroughly examined, and appropriate action will be taken. Further, on the basis of some definite proposals put before them, the Executive Council have set up a Sub-Committee, who will next year submit, again after consultation with the National Committees, certain proposals for the "rational development" of, and for increasing the usefulness of, the World Power Conference. There should be good work for this Sub-Committee, in suggesting means by which the conferences may be prevented from becoming unwieldy.

The Council have decided to accept the tentative invitation of Sweden and of the Scandinavian Countries, and to suggest 1933 as the date of the next Sectional Meeting, to be held in Scandinavia, on the question of "Power Supply of Big Industrial Undertakings." The Third Plenary Meeting of the World Power Conference will take place in America in 1936.

Gas an Important Part

FROM the gas point of view, the Berlin conference represented a great advance upon the first conference held at Wembley six years ago; and in the report of the last meeting of the Central Executive Board of the National Gas Council (published in this issue) reference is made to the important part which the subjects of carbonization and gas distribution and sales now play in the proceedings of the conference. It is also remarked by the Central Executive Board that, though no new discovery of a sensational nature was revealed, promise was held out of a process for the production of cheap oxygen. Mention is made of this latter point in our review of the proceedings, in connection with the discussion at one of the gas sessions. In the nature of things, however, the discussions were not in a form to facilitate reporting. While on this subject, it may be mentioned that on more than one occasion speakers in the discussions manifested a tendency to dwell unduly upon detail; and though this may be difficult to avoid, it will be as well in the future to do so as far as possible. A conference of such a character as this will find its labours sufficiently arduous if they are confined to dealing with the major problems of power.

Synopsis

OF the wealth of technical fare at the Conference, we publish in this number of the "JOURNAL" extracts of all the communications which apply directly to our industry. Our report commences with Mr. T. P. Ridley's paper on the nature and extent of public control of gas undertakings, and the effect of such control upon their economic relations between consumer and supplier in Great Britain. His contribution will be a source of reference for some time to come. The importance of the industry to the nation is shown by the capital invested (£180,000,000), the number of employees (100,000), and the annual sum paid in local rates (£2,500,000). At the present time the gas supply is provided by 774 statutory undertakings selling 282,500 million c.ft. a year, and about 600 non-statutory concerns selling 7500 million c.ft. The statutory undertakings consist of 455 companies and 319 municipalities, the former being responsible for 64 p.ct. of the total gas supply. The author mentions that during the past twenty years or so the companies have developed sales to a greater extent than the municipalities. The percentage increases in the sales of gas from 1907 to 1928 are: Provincial companies 72 p.ct., municipalities 49 p.ct. There are now over 7 million gas cookers (mostly on hire) and 10 million gas fires (also mostly on hire) on consumers' premises, and there are on the streets between eight and nine hundred thousand public lamps. The rates of dividend paid to holders of ordinary stocks have increased, and at the same time the total charges for capital per 1000 c.ft. of gas sold have decreased; and the industry is looked upon by the public as the most enterprising of the old public utilities. "The fact that the undertakings have developed so much and are so virile to-day shows that the effect of public control upon the operation of gas undertakings and the relations between supplier and consumer has been beneficial to both the undertakings and the consumers."

Next come Mr. J. W. Wood and Mr. G. B. Howarth, who discuss the principles of design, construction, operation, and testing of domestic gas-heating equipment, and who summarize the findings of the Joint Research Committee of the Institution of Gas Engineers and the University of Leeds. They put forward the following figures for the thermal efficiency (gross basis) of gas appliances: Boiling rings, 40 to 50 p.ct.; geysers, 75 to 80 p.ct.; fires (radiation efficiency), 40 to 45 p.ct. Then Mr. E. A. Leask outlines what is being done by the Leeds Gas Department to encourage the use of gas in industry; and most of his information is generally applicable to the gas industry. He emphasizes the need for having demonstration shops, and explains their effect on the sales of gas to manufacturers in Leeds, who have now got the "demonstration habit." The author also devotes attention to the staffing of the industrial section of a gas undertaking. Industrial salesmen must have a sound engineering training; they ought to know the details of the various industrial operations carried out in their area of supply, so that when they approach a prospective customer they may be in a

position to talk his own language. The great value of industrial surveys and careful records is also stressed by Mr. Leask.

Highways and Byways

Mr. Stephen Lacey deals with the vexed question of mains and cables in highways, with particular reference to conditions in the Metropolis. Very interesting are his remarks on the matter of subways. While it is true, he says, that pipes in subways are protected from ground movements, and from large temperature changes, and consequently the risk of serious leakage from gas mains is small, it is not possible to eliminate altogether the risk of leakage on a scale much greater than that with which the ventilation can be designed to deal. The author's experience in regard to the relative costs of laying and maintaining gas mains in subways and in the sub-soil of roads is that the actual saving, if any, is small, and certainly insufficient to pay the annual charges on the capital expenditure on the subway. He concludes that the cost of building pipe subways in existing roads is, generally speaking, prohibitive. Mr. Lacey considers that the provision of ample width of footway is the most promising line for improvement in the accommodation of mains and cables in future roads. In city streets, one improvement could be made at relatively little cost when widening—the restriction of the height of vaults and basements to at least 4 ft. below pavement level, so that a reasonable depth of soil is provided between the footway level and the top of the vaults. Many footways in London streets cannot be used for the laying of mains because the tops of the vaults or cellars are only a few inches below the flagstones.

The effect of fluctuations in the price of coke and bye-products on the cost of gas production is dealt with by Mr. M. Barash, who has collated a series of valuable tables which, like those of Mr. Ridley, will be a source of reference. He observes that a variation of one shilling in the selling price of coke per ton affects the cost of gas production to the extent of 3 to 4 p.ct. As a fairly normal fluctuation is of the order of 5s. per ton, this one item would account for a variation of from 15 to 20 p.ct. in the cost of gas production. The author, having emphasized that the balance of receipts for bye-products far outweighs any economies that can be effected by the use of large units, goes on to discuss the virtues of steaming in continuous vertical retorts. One of the chief advantages of this method of working is that it allows of quantitative adjustment of the yields of gas and coke to the varying requirements of the market. Mr. Barash states that the steam reacts mainly with the carbon on the outer surfaces of each piece of coke, tending to reduce the average size of the coke pieces, and resulting in the production of breeze of inferior quality, but not having a very marked deleterious effect on the large coke. He shows the importance of a good tar market; and on the question of benzole recovery he says: Taking into consideration the cost of debenzolizing plant and the working costs of the process as against the enriching effect which this benzole has on the cheap water gas present in the mixed coal gas, as well as other advantages of allowing it to remain in the gas, it is evident that the recovery of benzole is not a paying proposition in the gas industry.

To Extract or Not to Extract?

Following a survey of the disposal of effluent liquors, by Dr. A. C. Monkhouse, Mr. H. Hollings considers the economics of benzole extraction in the gas industry. He points out that the adoption of benzole extraction by an undertaking making only coal gas represents an increase in business which, expressed upon a thermal basis, is equivalent to an increase in gas sales of about 6 p.ct. In the case of an undertaking making a mixture of coal gas and water gas, the increase is slightly less. This increased business continues uniformly day and night, and may be terminated at the convenience of the undertaking without regard to any statutory obligation to a gas consumer. Also, the business may be secured without expenditure on gasholders and mains. The author explains how the programme of a gas undertaking may be modified in several ways in order to meet the circumstances created when benzole is removed from the gas. Discussing the production of richer gas prior to extraction, Mr. Hollings says it would appear that the vertical retort plant to which steam is normally admitted during carbonization should lend itself particularly to alterations in the calorific value of gas produced designed to permit of the extraction of benzole without alteration in the calorific value of gas distributed to the consumer. For example, an undertaking may be supplying gas with a calorific value of 475 B.Th.U. to its consumers, and such gas may be made entirely in vertical retorts to which steam is added. If the whole of the benzole is extracted from the gas the calorific value would be decreased to about 450 B.Th.U. per c.ft. Such a reduction may be prevented by a reduction in the amount of steam admitted to the retorts when the extraction of benzole is commenced, so that the calorific value of gas made in the retorts is raised to about 500 B.Th.U. This will have the effect of reducing the gas-making capacity of the retorts, but this in itself cannot be regarded as a disadvantage provided that arrangements are made to discontinue the extraction of benzole and increase the output of gas from the retort house at the time of the maximum demand for gas.

Mr. Hollings concludes that, when the calorific value of gas to be delivered to consumers is relatively high, or when for any other reason there is any special difficulty in increasing the calorific value of the gas normally made, the cost of thermal replacement is likely to be higher in the case of gas made in vertical retorts to which steam has been admitted than in the case of gas of higher calorific value made in horizontal retorts or ovens. This, however, is by no means a general disability of the process involving the admission of steam to the retorts, for there are circumstances in which the proportion of steam admitted may be advantageously reduced when benzole extraction is introduced.

To an End

The next contribution is by Sir Francis Goodenough, C.B.E., on the training of gas technicians. The paper is concerned with the Education Scheme of the Institution of Gas Engineers; and the author remarks that there is ample evidence to show that the Scheme will ultimately exercise a great beneficial influence on our industry. As an indication of the development of the Scheme it may be mentioned that the number of students sitting for examination in 1925 was 108, while the corresponding figure for last year was 318. Sir Francis states that the next step will probably be the development of arrangements for releasing young men for one or two afternoons a week in order to attend school. This arrangement exists quite commonly in the mechanical engineering industry, but has not yet been found practicable in the gas industry except in one or two instances. There is no doubt, however, that it will ultimately be widely adopted.

Mr. R. A. Burrows and Mr. N. Simpkin consider the sale of coal under specification; the purchase and sale of coke to specification is dealt with by Mr. E. C. Evans; while Dr. C. H. Lander discusses the economic and commercial development of low-temperature carbonization in Great Britain. He mentions that, as distinct from the gas and coke industries, low-temperature carbonization has no predominating product of its own. "The profitable character of low-temperature carbonizing plants with coke as the main product can only be partially assured if the gas generated can also be disposed of at a profit. . . . The best economic solution seems to be that of connecting low-temperature carbonization plants with gas-works, where the distribution of coke and sale of gas provide favourable conditions for development. The linking of low-temperature carbonization plants and power stations has not made any great progress, as yet, in England."

Our report of the Conference is brought to a close by an extract of a paper by Sir Robert A. Hadfield, Bart., and Mr. R. J. Sarjant on the "Relative Places of Gas and Electricity in Industrial Heating," who say that a gas fired furnace is the most flexible of all furnaces. Elec-

tric furnaces are only flexible within a limited range, though that range may be sufficiently broad to cover many industrial requirements. An electric furnace cannot be forced to the extent possible with a gas furnace, and in general the rate of utilization of heating surface is higher in the fuel-fired furnace.

Correspondence Classes

OUR readers will learn with the liveliest interest and satisfaction that the subject of postal tuition in gas salesmanship is to be discussed by the Executive Committee of the British Commercial Gas Association at their meeting today. This information is contained in a letter from Sir Francis Goodenough which is published in this issue of the "JOURNAL." We are glad that this step has been taken; and we hope that the industry will have before them at the annual conference of the "B.C.G.A." next October the main lines of an acceptable scheme. We believe that authorized correspondence classes in gas salesmanship would meet with an immediate response, the enthusiasm of which might surprise not a few of those responsible for the progress of gas undertakings in face of severe competition.

At this stage we do ask the senior members of our industry to show individually enthusiasm in this matter of education, and not leave it to a few unselfish, energetic, and already overburdened workers to undertake the digging in the hard soil of another new section of the field. The surest—indeed, the only—way to overcome competition lies in encouraging men to train for the industry, welcoming them when they are trained, and paying them salaries which befit their worth and status.

The foregoing relates to postal tuition in salesmanship for those engaged in selling gas and gas appliances. In regard to correspondence classes for students in gas engineering or gas supply, Sir Francis points out that this phase of the question will form the subject of special consideration at the next meeting of the Gas Education Committee of the Institution of Gas Engineers, which will be held immediately after the holiday season.

Barnsley Not Alone

THE gas ban on tenants of municipal houses at Barnsley has been referred to on more than one occasion, both in these pages and elsewhere; and from a report which appeared on p. 98 of last week's "JOURNAL," it seems that the Town Councils of Dover and Wrexham are also now "showing a similar hostile attitude towards the in-"stallation of gas in new housing estates." The trouble is not a new one, of course; but it is regrettable that it should go on increasing in this way, and one could wish that fortune had smiled upon the new clause proposed last week, when the Housing (No. 2) Bill, as amended in the Standing Committee, came before the House of Commons. This new clause was to stipulate that local authorities should not impose any term, condition, or restriction with respect to the form of light, heat, power, or energy to be used in any house provided by them. The arguments adduced in its favour appear to us to be unanswerable, but this did not save the clause from rejection.

The matter is one of which sight should not be lost by the gas industry, who should on every appropriate occasion emphasize the unfairness of binding tenants to a particular form of lighting and heating. Council houses, from causes which are well understood, are much in demand; and it is not right that there should be laid down limitations which, under more competitive conditions, it might be impossible to enforce. A council house should be one in which an independent tenant would delight to live, and not what he might perhaps regard as a species of "tied house." With so large a proportion of the authorized electricity undertakings of the country owned and operated by local authorities, the seriousness of the question is obvious. It is, in fact, calculated that in the aggregate there are already more than 80,000 houses upon which restrictions have been imposed with reference to the use of gas.

Street Lighting by Gas.

The gas street lighting of London and Paris is traditional on the score both of quality and quantity. It is, however, probably not so generally known that about 87 p.ct. of the street lighting of Berlin is by gas, and of its efficiency those who have seen it can harbour no doubt.

Solving Unemployment Problems.

American business interests, according to the "Co-Partnership Journal" of the South Metropolitan Gas Company, are proposing to maintain production at its full capacity, to retain employees at full work, and to keep wages at their present level, in order to check increased unemployment. "In an attempt to reduce unemployment in the iron trade in Germany," it is added, "an arbitration award in favour of simultaneous reductions in wages and prices has been declared binding upon the employers and employees by the German Minister of Labour. The reduction in prices is to be larger than that in wages, and is to come into operation earlier. The effect, of course, will be to increase the sale of German manufactured goods in foreign markets by reason of lower prices. "The scheme is the result of the recognition both by Capital and Labour of the necessity to reduce costs of production, and is a gesture by each of a willingness to make a present sacrifice to obtain an ultimate benefit."

PERSONAL

Mr. JOHN HOOD, who formerly held an appointment with the Shrewsbury Gas Company, has been appointed Engineer and Manager to the Birkenhead Gas Department. For the last nine months he has been Deputy Engineer at Birkenhead. He received his early training at Wigan, and before the war was at West Bromwich. Later, following the war, Mr. Hood was at Shrewsbury, and in 1925 he was Assistant Engineer at Cheltenham.

Mr. W. T. BILSON and Mr. G. H. D. WEBBER, Collectors to the Reading Gas Company, retired on pension on June 30 after nearly 40 years' service. At a meeting of the Directors of the Company, the Chairman, Alderman Stanley Hayward, J.P., presented each with a substantial cheque, and, in doing so, expressed the appreciation and thanks of the Board for their services and wished them health and happiness to enjoy their well-earned retirement. Subsequently, a meeting of the staff was held in the Company's Lecture Room when Mr. A. B. Stedman, the Secretary, on behalf of the staff, presented Mr. Bilson with a pair of Oriental vases, together with a brooch for Mrs. Bilson, and Mr. Webber with a leather suitcase and wrist watch, the gifts in each case being accompanied by an appropriate illuminated address.

OBITUARY

The death occurred on July 11 of Mr. HARRY WALLIS PACKHAM, aged 60, of "Lima," Kingston-on-Thames, formerly Managing Director and Engineer of the Kingston-upon-Thames Gas Company.

Forthcoming Engagements.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

July 23.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

July 25.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Meeting of Chairmen and Secretaries of the Gas Salesmen's Circles at the Board Room, 28, Grosvenor Gardens, S.W. 1, at 2.30 p.m.

Aug. 19 and 20.—IRISH ASSOCIATION OF GAS MANAGERS.—Meeting in Dublin.

Sept. 8-11.—ASSOCIATION OF PUBLIC LIGHTING ENGINEERS.—Annual Meeting and Conference at Leicester.

Sept. 11.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting at Aberdeen.

Sept. 18.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—General Meeting at Porthcawl.

Oct. 10.—MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.—Visit to the Manchester Corporation Gas-Works at Partington.

Oct. 27 to 29.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Meeting at Hull and Bridlington.

CORRESPONDENCE

Correspondence Classes.

SIR,—The important letters which have appeared in your columns recently on the subject of Correspondence Classes deal with two quite separate questions: (1) Correspondence Classes for Students in Gas Engineering or Gas Supply; (2) Correspondence Classes in Salesmanship for those engaged in Selling Gas and Gas Appliances.

As Chairman of the Gas Education Committee of the Institution of Gas Engineers, I would like to inform your readers that it has been arranged that question (1) shall form the subject of special consideration at the next meeting of that Committee—namely, immediately after the holiday season. Were the Committee straightaway to agree in principle to the organization of Correspondence Classes approved by the Institution for the study of Gas Engineering and Gas Supply, and their ancillary subjects—which it must not be assumed they will—it would not be humanly possible to make fully considered arrangements for such a very important scheme in time to put it into operation this autumn; so that no time is being lost in considering the proposal now renewed, especially as the interval will be spent in exploring the possibilities.

As Chairman of the British Commercial Gas Association Executive, I would like to say that question (2) will be discussed at their meeting on July 16, though the discussion will necessarily not be confined to Correspondence Classes. Should immediate action then be decided upon, it would not be possible to get a properly planned scheme for Education in Gas Salesmanship put into operation before the early days of the New Year. Mr. Rogers speaks of "the early autumn of this year;" not only is it impossible to plan and put into operation a sound scheme in so short a time, but it must be remembered that the last three months of the year are the "rush" months for all the sales staff of gas undertakings, and the least suitable for class work. A scheme operating from January to May, inclusive, would, I think, be much more acceptable to employees and employers alike. The Annual Conference of the British Commercial Gas Association at Hull would afford a good opportunity for putting the main lines of such a scheme before the industry.

May I add that, in the consideration of plans for improving our methods of educating and training our commercial personnel in this country, sight has not been lost of the needs of our own industry. It must not, however, be forgotten, when we are reminded of 1914 and 1924, that the war broke out within a few weeks of the conference at which Mr. Rogers read his paper, and created other immediately pressing problems that absorbed the energies of many of us for many years, and that the organizing and adjusting of the Institution Education Scheme for Gas Engineering and Supply has called for a good deal of thought and work in the post-war years, especially from 1923 onwards. Moreover, many of us believed, whether rightly or not, that the establishment of that Scheme on generally acceptable and effective lines was an essential precedent to the organization of a further scheme for the commercial, as distinct from the technical, education of our commercial personnel.

In the meantime, and as a useful and necessary preparation for the next step in the development of our educational work, the Salesmen's Circles have been founded with no little success and promise. They are playing and will play a valuable part in the mutual education of their members, none the less real because it is not officially labelled "Education."

I agree fully that the time is at hand for the further step to be taken in our organized Education Schemes; I welcome the demand for it; and I hope that adequate support and help will be forthcoming in its planning and execution.

FRANCIS GOODENOUGH.

Horseferry Road,
July 10, 1930.

SIR,—The proposal to run Correspondence Classes in conjunction with the Fuel Department of the Leeds University may not "cut across the aims and objects of the present Education Scheme," but it will inevitably be the last straw on the burden of those who have endeavoured to organize classes at approved provincial centres.

If a conference is to be held to consider the proposal put forward by Mr. Blundell, it would be well for the delegates to be conversant with the facts, the difficulties that beset the present Scheme, and the requirements of the Charter of the Institution.

The Education Committee have devised a Scheme for educating the employees of the industry; and the Technical Colleges at approved centres have, at considerable expense, provided facilities that should make the Scheme practicable.

The number of students taking the Institution Course, at many centres, is insufficient to justify the continuance of classes; and students taking the main subject only have to be admitted to make the requisite minimum. Plainly, the Colleges have provided the facilities, and the industry has failed to produce the students. It is true that the course is not an easy one, but students would be forthcoming if the industry was prepared to pay their share for the benefits they hope to derive from an improved personnel.

Those who have been in close contact with students are aware that considerable dissatisfaction has arisen from what Mr. Bell refers to as the "short cut." Youths taking the full course, three or four nights per week for five, six, or seven years, find that one weak subject lands them with a second class certificate, while the easy going "external" candidate, with a lesser knowledge of ancillaries, laughingly produces a first. They put up with the handicap placed on them by lack of uniformity of standard at different centres, but the "short cut" facilities have disheartened many *good* fifth-year lads.

Leaving the Education Scheme and its students, let us take a broader view. It is the general opinion that the industry is in need of men of higher education. Why, then, does it fail to attract the graduates who are annually pouring from our Universities, Technical Colleges, and Mining Schools? These men are looking for jobs, and they go to the professions that offer the best reward. It is moot-point whether every graduate would be an acquisition to a gas-works staff. Many of them would have to "unlearn" a few things; but, with a temperament attuned to the humdrum of everyday routine, their knowledge would give them a pull over the man who worked by rule-of-thumb. The larger gas-works can, with advantage, absorb degree men as specialists, but the smaller works cannot afford specialists on their permanent staffs. Conversely, the graduate would be "wasting his education" on a small works.

Still it is to the small works that one looks for improvement, and sufficient recognition is not generally given to the fact that the strength of the industry still lies in the hundreds of small works scattered up and down the country. The future efficiency of small works depends on the qualifications of their staffs, and the status of the industry will be a reflex of the efficiency of each works. It is therefore of the utmost importance that the rank and file should be brought within the scope of the Education Scheme.

That the Gas College attracts students cannot be denied. Their figures speak for themselves. Glancing through their course, one would find little to criticize, and their methods certainly help students to answer questions in the examination room. Whether tuition by correspondence will produce the men Mr. Frank Jones is looking for is another question.

The Southern Education Committee suggest "that tuition by correspondence is just as satisfactory as the present methods." Can they square this with the addresses of their ruling President? I suggest that they look over the sound advice he has offered, and discuss the matter anew. Their considered opinion would have far-reaching effect, and one would pray: "May the decision rest on the casting vote of the President."

It has been my experience that class tuition, with demonstration visits to well equipped works, commands the keenest interest of the students. They seldom miss a class, and in two or three years it is not unusual for some of them to teach the teacher. Hitherto it has been necessary for those connected with the Education Scheme to play the team game, but the time has arrived when they should put forward points gained from their experience in its administration, and suggest how better results can be attained. Destructive criticism cuts little ice. For seven years I have been of the opinion that it would have been better to take the industry as it stood, and concentrate on the main subjects. Travelling teachers should have been appointed in each district. Classes could have been held in a number of centres, and the subject dealt with from retort to consuming apparatus.

Such an arrangement would have reached scores of promising young men who could not afford to travel 20 or 30 miles to an approved centre. It would have leavened the country with men who, by this time, would be ready, "gloves off," to meet the competition that is threatening small undertakings; and would have awakened an interest in the more ambitious youths that would have sent them to the Technical Colleges for ancillary subjects.

I have heard many salesmen say that such a course would be useful to them; and, further, that, "given a cheap therm, they could sell gas, and gas apparatus, without having a Diploma in their pockets."

J. MOGFORD.

2, *Derwen Road, Llanishen, Cardiff,*
July 12, 1930.

SIR,—Mr. Rogers suggests that I might be willing to arrange Correspondence Classes in Gas Salesmanship. I should be very pleased to do so.

In 1925 I planned a complete Course for Gas Salesmen, and

at considerable expense I collected the whole of the data required, and arranged it in lesson form.*

I am open to modify the syllabus in any way or to accept any syllabus which may be drawn up, and to place the information that I have before any Committee which may be appointed to go into this question. I would have no objection whatever to the supervision of such a course by representatives of the Institution.

It would take us not more than four weeks from a decision being reached to place ourselves in a position to accept students for a course of study in Gas Salesmanship.

ARTHUR COE,
Principal.

The Gas College,
3, Thrum Hall Lane, Halifax,
July 11, 1930.

* Mr. Coe encloses an abbreviated syllabus of this course.—ED. "G.J."

The Line of Demarcation.

SIR,—I was interested in reading your editorial note regarding my articles on rationalization, particularly in relation to tariffs. If you will allow me to say so, you misinterpreted my words, and your own logic is faulty. You repeat my words in your editorial, which are as follows: "The small consumer gets gas too cheaply, being subsidized by the larger one." Your comment is as follows: "If the unremunerative customer is penalized, it does not follow that the customer of small income will have to pay more for his gas." I said nothing about the customer of small income. You have introduced this expression to make a point which I had not brought into the discussion. I am fully aware that the unremunerative consumer is not necessarily the "poor" consumer, using the word "poor" in relation to the possession of this world's goods.

You say I am pessimistic. I do not think that I am pessimistic in foreshadowing violent opposition from any group of consumers who are asked to pay more for a certain commodity. If I had said that this violent opposition is an insuperable difficulty to the imposition of a two-part tariff, then you could have accused me of pessimism. I am an advocate of the two-part tariff. I should be prepared to lose a few customers; in fact, I have often argued that the financial position of some undertakings would be improved by losing such customers. From this you will gather that with the rest of your remarks I am in full agreement.

However, the choice of definitions does not alter the fact that the raising of the price to the small or unremunerative consumer is a serious practical difficulty, but I think it must be faced.

GEORGE EVETTS.

159, *Palace Chambers,*
Bridge Street, Westminster, S.W. 1,
July 10, 1930.

Hours of Industrial Employment.

SIR,—I am desired to inform you that, in view of the possibility of the Hours of Industrial Employment Bill being brought before Parliament again next session, the Household Appliance Section of the London Chamber of Commerce, at a meeting last week, adopted the following resolution:

"That, in the opinion of the Household Appliance Section of the London Chamber of Commerce, the Hours of Industrial Employment Bill should be opposed so long as Great Britain is in competition with countries where wages and conditions are below those prevailing in this country."

W. V. STEVENS,
for Deputy Assistant Secretary.

The London Chamber of Commerce (Incorporated),
1, 2, and 3, Oxford Court, and 97, Cannon Street,
London, E.C. 4,
July 7, 1930.

Results at Bradford.

SIR,—I regret to find, in your résumé of the statement on the working of this Department during the last financial year in the current issue of the "JOURNAL," you state that "during the period the sales of 249 cookers, 137 fires, 4 boilers, 6 radiators, and numerous smaller items were concluded." A reference to the context will show that these figures refer to the business done in the travelling show room alone during the nine months of the year in which it was in use. Table G in the Appendix to my Report gives the total figures, which were 874 cookers, 656 fires, 606 boilers, 48 water heaters, and 37 hotplates. In justice to our showroom staff, I should be glad if you would make the correction.

ERNEST J. SUTCLIFFE,
Gas Engineer and Manager.

Town Hall, Bradford,
July 12, 1930.

National Gas Council

Central Executive Board

A meeting of the Central Executive Board of the National Gas Council was held at 28, Grosvenor Gardens, S.W. 1, on Tuesday, July 8, 1930, at 2.30 p.m.

Sir DAVID MILNE-WATSON was unanimously re-elected Chairman for the current year. Alderman F. S. Phillips, Mr. Wm. Cash, Mr. J. H. Ellis, and Mr. Frank Jones were re-elected Vice-Chairmen of the Board.

PARLIAMENTARY.

Gas Legislation.—The CHAIRMAN reported an interview with the President of the Board of Trade which had taken place that morning with regard to the amending gas legislation which was so urgently needed. Consideration was then given to those clauses to be inserted in the draft Bill relating to gas charges, and it was stated that they had already been the subject of careful scrutiny by the Gas Charges Committee that morning.

Mr. C. S. SHAPLEY gave a report to the Board of the work which was being done by a small Committee which he had appointed of representatives in the West Riding of Yorkshire District to consider the gas charges position in relation to the unremunerative consumer. Mr. Shapley said that there was urgent need for gas undertakings to have freedom to re-arrange the basis of their charges, in order to cope with the present position.

The CHAIRMAN pointed out that elasticity with regard to gas charges would have the effect not only of assisting the gas industry, but would be beneficial to industry in general, by facilitating the supply of cheaper fuel. The Chairman impressed upon members of the Board the necessity for the gas industry obtaining amending legislation at the earliest possible opportunity, and reminded them that in this matter they had already received the strongest support of the National Fuel and Power Committee and the Departmental Committee on Area Gas Supply. He urged the members to take every opportunity to use their influence in order to impress upon Members of Parliament the urgency and importance of new gas legislation.

Coal Mines Bill.—It was reported that the House of Lords had adhered to the amendments which had been put forward by the Council and by the Conjoint Conference of Public Utility Associations.

Finance Bill.—It was stated that under the Finance Act of 1927 gas undertakings were enabled in cases of amalgamations to obtain exemption from the capital and transfer duties, but not in respect of capital which had been authorized before the year 1890. A Memorandum relating to this matter had been presented to the Chancellor of the Exchequer, and a deputation from the Conjoint Conference had appeared before the Financial Secretary to the Treasury. It was most satisfactory to be able to report that the Treasury had agreed to accept an amendment whereby Companies could claim exemption from capital and transfer duty in the case of amalgamations with regard to capital authorized before 1890 in like manner as they could claim exemption in respect of capital authorized subsequent to that date.

The amendment agreed by the Treasury had been put down and accepted by the Government, and was now incorporated in the Finance Bill.

Housing (No. 2) Bill.—It was reported that the amendment prohibiting the restriction of the use of gas in council houses subsidized by the Central Government had come before Standing Committee A the previous week. Unfortunately, however, this amendment had been lost.

REPORT OF THE AREA GAS SUPPLY COMMITTEE.

The steps which were being taken to carry out the recommendations of this Report were referred to. The attention of the Council was drawn to the unsatisfactory coke position in various parts of the country, and it was decided that a conference of representatives of the Commercial Sections of the various Gas Engineers' and Managers' Associations should be called to consider the position before the end of the month.

RATING ASSESSMENT.

A case was reported where the Assessment Committee had departed from the orthodox method of valuing a gas under-

taking, and the Board approved the action of the President in authorizing the officers to take Counsel's opinion.

The matter was referred to the Rating Committee of the Council, who were given power to decide whether an appeal should be proceeded with.

LIGHTING OF RAILWAY STATIONS AND GOODS YARDS.

Mr. H. D. MADDEN reported the proceedings of the deputation of South Wales Undertakings to the General Manager of the Great Western Railway Company in connection with the threatened replacement of gas lighting in connection with Railway Stations and Goods Yards. Mr. Madden stated that the deputation were able to give figures emphasizing the fact that the amount of traffic of gas undertakings which passed over the lines of the Railway far outweighed the amount paid by the Railway Company to the gas companies for gas consumed. Mr. Madden said he felt that the interview had served a useful purpose.

WORLD POWER CONFERENCE.

It was reported that this Conference, which was the successor to that held in Wembley in 1924, had dealt with the entire range of subjects connected with fuel and power. There were over 4000 registered members, and 400 Papers had been presented at the Conference. Some 430 delegates had taken part in the discussions. No new discovery of a sensational nature was revealed at the Conference, but a promise was held out of a process for the production of cheap oxygen.

So far as the gas industry was concerned it was interesting to note the important part which the subjects of carbonization and gas distribution and sales now played in the proceedings of the Conference.

It is proposed to publish the transactions of the Second World Power Conference in 21 separate small volumes at 30s. per volume, and it is hoped that this will encourage representatives to obtain copies of the Papers relating to the subjects in which they are most interested, together with the discussions which took place thereon.

NEXT MEETING.

It was decided to adjourn the meeting of the Board until Sept. 19, 1930.

THE NEWS OF THE WEEK

Coke Oven Managers and others concerned with the carbonization of coal will find much of interest in the Quarterly Bulletin of the Coke Oven Managers' Association published this month.

The tenders for the £50,000 6 p.ct. redeemable preference stock which was offered for the Directors of the Oxford and District Gas Company were opened on July 9. They amounted to a total of £168,105, and the prices ranged from £105 per £100 down to the minimum of par, the average price obtainable being £101 15s. 6d. p.ct.

Good News for Consumers has followed the adopting of the report of the Stratford-upon-Avon Gas Committee. The Town Council have decided to reduce the price of gas by 2d. per 1000 c.ft. as from June 30 last. It was also agreed that the lower price now being charged to consumers of 25,000 c.ft. per quarter should be extended to consumers of 16,000 c.ft. per quarter. This, it was stated, would reduce revenue during the coming year by £1056.

Medals for Merit were awarded at the Royal Sanitary Institute Congress and Exhibition at Margate. They included: Silver Medals—Sidney Flavel & Co., Ltd., of Leamington Spa, for an exhibit of the "Metro" coke fire; the Isle of Thanet Gas Light and Coke Company, for gas cooking and heating appliances; Low Temperature Carbonisation, Ltd., for an exhibit of "Coalite" smokeless fuel. And among those whose displays were commended was White Tile Heaters, Ltd., of Clementhorpe Works, York, for the "Lambert" instantaneous water heater.

The Attractive Gas Exhibition held at Cork and the cookery demonstrations by Miss E. Sanderson (Radiation Ltd.) have been very successful. Over 4000 people have patronized the lectures, and all expressed their appreciation of the efficiency of the lecturess, and the success with which she prepared menus covering all classes of cookery. Miss Sanderson illustrated the possibilities of the modern gas cooker by cooking a whole dinner in a "New World" cooker for a little over 1½d., and the resultant dishes were admired by the large audience. Miss Sanderson had a prize competition for cakes cooked in a gas stove, and about 140 cakes were sent in, which, with very few exceptions, evidenced a surprising amount of highly successful cookery.

Thermal Storage is the subject of a recent number of "A Thousand-and-One Uses for Gas," published by the "B.C.G.A." It is stated that a large demand is arising for these new heaters, as they are so remarkably economical in running costs, the maximum consumption being only 10 c.ft. per hour. Some practical suggestions are given to be followed when arranging the installation of water heaters of the types described in the publication. An interesting chart is included showing the water-heating capacities of three forms of thermal storage gas water heaters and the approximate weekly cost of heating water by the different appliances. It also indicates which forms and sizes of heater are of suitable capacity for meeting any given daily demand for hot water.

A Lady Demonstrator has been engaged by the Hereford City Council for a period of from ten to twelve months in order to give lectures and demonstrations in gas cookery on behalf of the Gas Department.

Electrical Installation Work is the subject of a new Pitman publication in the series "Definitions and Formulæ for Students." This booklet, which can be obtained from Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, W.C. 2 (at 6d. net), is by Mr. F. Peake Sexton, A.R.C.S., A.M.I.E.E., M.I.E.I., and its object is to provide the installation engineer or wireman with the necessary data for his daily work.

Continuous Press Publicity has been carried out during the past three months by the Barbados Gas Company in order to bring home the advantages of gas for cooking. Mr. J. W. Brown, the Engineer and Manager at Barbados, tells us that there is, of course, a great difference between the public at home and out there. The advertising has to educate the public, as it is almost impossible to get the average person to compare gas for cooking with any other method except on the basis of first cost. Whenever possible the Company took advantage of a topical subject to form a headline for their advertisements—for example, "Lest we forget" appeared on the Eve of Empire Day; and "Economize," relating to the economic problem of the Island under consideration at the time.

Budding Heating Engineers who desire to become Graduates and Associate Members of the Institution of Heating and Ventilating Engineers are reminded that examinations are held at suitable centres in January, May, and September each year. Intending candidates should apply to the Secretary at the address given below. The Institution was established in 1897, and its object is to promote and advance the science of heating and ventilation and kindred subjects. Application forms for membership may be obtained from the Secretary, Mr. H. B. Watt, 12, Russell Square, W.C. 1. Associate Members and Graduates Section branches are in existence in London and Manchester and are being formed in other centres, so that members of these grades may have the advantage of frequent meetings.

At the Extraordinary General Meeting of the European Gas Company, held on March 11, 1930, special resolutions were passed (1) altering the Company's constitution, and (2) authorizing the Directors, subject to the confirmation of the first resolution by the Court, to convert all registered shares into stock. This confirmation was obtained on June 23, 1930, and accordingly that portion of the Company's capital which is at present represented by registered shares will be represented in future by registered stock, transferable in units and multiples of £1. Application is being made to the Stock Exchange for a quotation on the basis of £100 stock. That portion of the Company's capital which is at present represented by share warrants to bearer of £10 each is not affected by the conversion of the registered shares into stock, but bearer shares will, if the holder so desires, be converted without charge into registered stock.

THE NEWS—continued.

Activity at Coatbridge.

At a meeting of the Glasgow Corporation Gas Committee, there was submitted a letter on behalf of the Coatbridge Gas Company, stating that the Company had received a request for a supply of gas from owners and occupiers of premises in that part of the village of Glenboig which is within the area of supply of the Corporation; that the Company at present supplies gas on the opposite side of the village which is within their area of supply; that the Company proposes to apply to the Board of Trade for an order to supply gas to the premises, and inquiring whether the Corporation is prepared to consent to such an order being granted.

The Committee, after consideration of the letter, along with a report thereon by the General Manager to the effect that as the proposal affects 130 houses only, involving the Department in an expenditure of £3542 for the laying of mains, &c., to give a supply to the houses from the nearest Corporation main, which at present is 3000 yards distant, it would be an unprofitable extension for the Corporation to contemplate at present and agreed to recommend that the Corporation consent to the order proposed to be applied for by the Coatbridge Gas Company.

Council House Tenants and Gas.

The controversy between the Barnsley Corporation and the Barnsley Gas Company was again referred to at a meeting of the Town Council on July 8.

It will be recalled that some time ago the Corporation gave notice to the tenants of their houses that if they had gas installed it would be regarded as a breach of their tenancy agreements, and steps would be taken to terminate the tenancies. The Gas Company said they woud install gas where requested by either landlord or tenant. The " notice to quit " suggestion was eventually referred back with the intention of inquiring if gas had been put in any house without the permission of the tenant.

At the Council meeting, the Housing Committee reported that the Town Clerk had invited three tenants to attend a meeting, but in no case did the tenant appear. The minute continued: " The Sub-Committee considered the question of the Corporation supplying the various housing schemes and other Corporation undertakings with gas, and recommend that the Town Clerk make inquiry and report."

The Chairman of the Committee (Ald. Mason) said that the tenants, with the exception of the three, gave permission for the gas to be installed, but those three failed to attend before the Committee when requested to do so.

Notes from Scotland.

The Muirkirk Gas Light Company, at the annual general meeting, decided to reduce the price of gas from 6s. 8d. to 6s. 3d. per 1000 c.ft.

An Increase of 1d. per 1000 C.Ft. has been agreed upon at Dundee following criticism at a meeting of the Law and Finance Committee, on June 30, of the estimates of the Gas Department. This will make the price 3s. 6d. per 1000 c.ft.

A Local Resident has agreed to advance the sum of £40,000 for the new gas-works at Elgin, to be lent in four instalments of £10,000 each for five years at 5 p.ct. The construction of the new plant has therefore been put in hand, the contract having been placed with the Woodall-Duckham Companies, whose tender for the carbonizing plant and foundations was £18,347.

A Successful Year was reported at the recent meeting of the Directors of the Kelty Gas Company, an increased sale of gas of over 3 million c.ft. being recorded. It was agreed to reduce the price of gas as from the last reading of the meters, which will make the charges as follows: Ordinary meters 3s. 11d. per 1000 c.ft.; slot meters 4s. 1d.; and for industrial consumers 3s. 1d.

A Refuse Dump is the spot suggested for the re-erection of the Dundee holder, which, it will be recalled, subsided after being built over a filled-in quarry, and which the Council decided to re-erect on an adjoining site. At a meeting of two thousand ratepayers in Lochee, however, a protest was made against the Council's decision, and a petition embodying the protest, and the suggestion for the re-erection of the holder on the refuse dump in South Road, has been under the consideration of the Council.

A Dividend of 5 p.ct. was declared at the annual meeting of the Pittenweem Gas Company, held in the Gas Offices—Mr. Andrew Tod, the Chairman of Directors, presiding. The abstract of accounts was considered very satisfactory. The Directors recommend that the sum of £100 be set aside as a reserve fund. They also recommended that the price of gas be continued as at present—5s. 5d. per 1000 c.ft.; that no meter rents be charged; and that the balance be carried forward to next year's accounts. The recommendations were unanimously approved.

Bottle Your Own Fruit.

Science has again come to the aid of the housewife. As the result of research work in connection with fruit and vegetable bottling in the home, it has been ascertained that absolute success in the operation can now be guaranteed with a modern gas cooker. In the past, success or failure has been largely a matter of luck. The average housewife has counted herself fortunate if, some months after the fruit has been bottled, she has found her supplies pure and unfermented.

Fruit, to be effectively preserved, must be correctly pasteurized by heating at an exact temperature for a definite period, and failure has commonly resulted from the inability of the housewife to estimate to a nicety the heat of the oven and the time required. The time and temperature vary for different fruits, and special precautions must be taken to ensure that the jars are completely airtight, so that no bacteria can enter. In the big canning factories elaborate machinery is installed to meet these conditions.

There are two methods of procedure available. The fruit can be pasteurized either by heating in the oven, or by being placed in water in a pan on the hotplate of a gas cooker. The latter method necessitates the use of a thermometer, and with it success is not assured.

Experiments have been conducted in the Radiation Research Laboratories with different kinds of fruit that will soon be in season—gooseberries, raspberries, cherries, pears, and plums—to ascertain the correct times and temperatures for doing the work automatically in a gas oven. The results of these experiments eliminate guesswork and ensure success for the housewife, as it has been found that the " Regulo " dial, which in the modern gas cooker automatically controls the heat, can be adjusted to suit whatever fruit is being bottled.

Experiments on the same lines with vegetables—such, for example, as beans, peas, mushrooms, and tomatoes—have also been carried out.

Joint Working in the Metropolis.

Extraordinary General Meetings of the South Metropolitan Gas Company and of the Commercial Gas Company will be held at the Cannon Street Hotel, E.C. 4, on Wednesday, July 30, and on Thursday, July 31, to consider an agreement between the two Companies, the main object being to enable the Commercial Gas Company to have the benefit of any premises, plant, organization, operations, or other facilities of the South Metropolitan Gas Company in relation to the manufacture and sale of gas.

The Agreement as affecting the Commercial Company also provides:

(*a*) For the analysis of samples of coal and/or residual products of coal, and the testing of apparatus by the South Metropolitan Company for the Company.

(*b*) For the giving of assistance by the South Metropolitan Company to the Company in relation to the purchase of coal and the sampling and disposal of residual products.

(*c*) For the unloading of coal at the South Metropolitan Company's landing stage at East Greenwich and placing into barges for the Company.

(*d*) For the exchange of £691,093 Commercial Gas Ordinary Stock by the holders thereof for £635,805 6 p.ct. Irredeemable Preference Stock of the South Metropolitan Company in the proportion of £100 Commercial Ordinary Stock for £92 6 p.ct. South Metropolitan Irredeemable Preference Stock. If applications for the exchange of the whole amount are not received, the Agreement is to become void.

(*e*) On the occasion of any future issue of capital by the Company, for the issue of a certain proportion of such capital to the South Metropolitan Company or for the exchange of a certain amount of such capital by the holders thereof for stock and securities of the South Metropolitan Company.

(*f*) For the appointment of a Director of the Company to be a Director of the South Metropolitan Company, and for the Directors of the Company to endeavour to secure that the Directors of the Commercial Company shall include three ordinary Directors of the South Metropolitan Company from time to time nominated by the Directors of the South Metropolitan Company.

(*g*) For payment by way of compensation by the South Metropolitan Company to any Director of the Company who, after the approval of the Agreement by the Board of Trade, intimates his willingness, in order to expedite the carrying into effect of the objects of the Agreement, to vacate his office as a Director of the Company, of a sum equal to seven years' purchase of the fees received by him during the year 1929.

SECOND PLENARY WORLD POWER CONFERENCE

DR.-ING. E. h. O. VON MILLER,
President of the Conference.

The Second Plenary World Power Conference, which took place in Berlin from June 16 to 25, continued the sequence of the World Power Conferences. The First Plenary Conference was held in London in 1924, and was followed by the Basle Sectional Meeting in 1926, the Fuel Conference, London, in 1928, and the Barcelona and Tokyo Sectional Meetings in 1929.

In the six years that have elapsed since the first World Power Conference at Wembley in 1924, changes have taken place so rapidly in power in all its phases that the second conference covered of necessity a much more complicated, and a much broader, field. The problems which in 1924 appeared to be of urgent significance have since been solved, and new problems have arisen in their place. These problems were considered in various aspects by the thirty-four sections, for each of which a General Report was prepared; the average length of the reports being rather more than 4000 words. They dealt with the contents of over 400 papers, representing contributions from each of the 48 countries taking part in the conference. Great Britain alone contributed about 50 papers. These were sponsored by the leading technical organizations and associations of this country, and each was examined with some care by a Special Committee in Great Britain before being approved for inclusion in the programme. The General Reports and papers that bear most nearly upon subjects in which "JOURNAL" readers are interested will be found abstracted later in this number.

SOME PROMINENT PARTICIPANTS.

The International Executive Council had as Chairman Mr. D. N. Dunlop, O.B.E. (Great Britain), as Vice-Chairman Dr. Ed. Tissot (Switzerland), and as Secretary Mr. C. H. Gray. Among the members of the British National Committee—the Chairman of which was Mr. Dunlop, and the Secretary Mr. C. Rodgers, O.B.E.—were many well known to the gas industry. There were Sir David Milne-Watson, LL.D., D.L. (National Gas Council), Mr. C. F. Botley (Past-President, Institution of Gas Engineers), Sir Dugald Clerk, K.B.E., F.R.S. (Institution of Civil Engineers), Dr. H. G. Colman (Institute of Chemistry), Dr. A. E. Dunstan (Institution of Petroleum Technologists), Sir Alexander Gibb, G.B.E., C.B. (Institution of Chemical Engineers), Sir Robert Hadfield, Bart., F.R.S. (Federation of British Industries), Mr. G. A. Hebden (Coke Oven Managers' Association), Dr. C. H. Lander, C.B.E. (Department of Scientific and Industrial Research), Dr. H. Levinstein (Society of Chemical Industry), Mr. R. J. Milbourne, J.P. (Society of British Gas Industries), Sir Charles L. Morgan, C.B.E. (Institution of Civil Engineers), Mr. W. H. Patchell (Institution of Mechanical Engineers), and Dr. E. W. Smith. The British Vice-President was the Hon. Sir Charles A. Parsons, O.M., F.R.S. Included among the ten British official delegates were Sir David Milne-Watson and Dr. Lander; while Mr. Harold E. Copp (the President of the Institution of Gas Engineers) was one of the honorary official delegates. The Chairman was Generaldirektor Dr.-Ing. E. h. C. Köttgen.

MAINLY PERSONAL.

After the visitors had spent Sunday morning, June 15, in admiring some of the many beauties of the delightful City of Berlin, many of them met together for the first time in the afternoon, at the Ingenieurhaus, where badges, cards of admission, &c., were distributed. Here one got some understanding of the problems involved in organizing and carrying out an international conference of this character, attended by several thousand persons, speaking a variety of languages; and one also realized that Germany would perform the task with thoroughness. The ease with which an Englishman can find his way and do his business in Berlin without knowing a word of German was distinctly gratifying to many from this country; but a reflection upon what would be the plight of a German similarly placed in England, was not so comforting. To find anyone without a more or less useful knowledge of ordinary English words seemed to be the exception. There is a moral here which should not be disregarded.

And while on this topic, the writer may, perhaps, without offence, set upon record his indebtedness to everyone of German nationality with whom it was his privilege to come in contact during a strenuous time in Berlin. Nowhere and by no one was anything left undone which could assist him in a difficult task or could minister in any way to his comfort. To the ladies of the Conference Staff—and in particular to those in the Press Room at the Kroll Opera House, whose ready help and unfailing thoughtfulness were deeply appreciated—indebtedness is acknowledged, and thanks are tendered. In another direction, though to mention names may possibly seem invidious, it is impossible to refrain from reference to the kind help afforded by Dr.-Ing. Karl Lempelius, Business Manager of the German Gas and Water Association, and by his Assistant. Under the tireless guidance, too, of Mr. Maximilian Gercke, of the "M.A.N." Augsburg Works, the writer spent many happy and profitable hours in studying Germany as she is. Further assistance in this way was rendered by Dipl.-Ing. Karl Barth, of the Progas-Union, and by Dr. B. Friedman, Managing-Director of Messrs. Junkers & Co. (Great Britain), Ltd.

THE PRESIDENCY.

The distribution of badges being completed, the members in the evening betook themselves in large numbers to the Reichstag, where, in the Council Chamber, the opening ceremony of the conference took place. The business consisted of the transfer of the Presidential Insignia from the Right Hon. the Earl of Derby, K.G., who had held office since the first conference in 1924, to the new President, his Excellency Geh. Baurat Dr.-Ing. E. h. O von Miller. Subsequently there was a reception by Dr. von Miller and Dr. Köttgen, when hospitality was dispensed, and the guests were free to admire the style and dignity of the handsome Parliament Buildings. Here one met many friends. To mention only a few, there were Sir David Milne-Watson, Mr. Harold E. Copp, Mr. E. J. Fottrell, Mr. J. R. Willis Alexander, Mr. Thomas Hardie, Dr. E. W. Smith, Dr. C. H. Lander, Mr. Alexander Mackay, Dr. R. Lessing, Dr. F. S. Sinnatt, Dr. A. C. Monkhouse, and last but no means least Dr. Lempelius and Mr. von Kardow.

Lord DERBY said it had given him great pleasure to come to Berlin, in order to celebrate with those present the inauguration of the Second Plenary Meeting of the World Power Conference, and, in person, to hand over the Presidency to his successor, Dr. Oskar von Miller. He felt very proud indeed

to know that the inauguration of the conference was due to his own country. He was in 1924, and remained to-day, President of the British Electrical and Allied Manufacturers' Association. The Council of that Association were responsible for the conference, and they invited him to accept the Presidency. Now 1924 seemed a very long time ago; and it was not, perhaps, altogether easy to recall the temper of a period already remote. It should be a source of great pride to all associated with the conference to know that the original World Power Conference was one of the very first great international gatherings during which members of countries which had been at war not so many years before sat down together, in order to discuss their common objects, to surmount their common difficulties, and to help to rebuild a shattered world.

The First World Power Conference was initiated by Mr. D. N. Dunlop, who remained to-day the Chairman both of the International Executive Council and of the British National Committee. He (Lord Derby) knew well in how large a measure the success which had been achieved was due to his creative imagination and organizing ability, and it must be a source of great regret to all that Mr. Dunlop was prevented by illness from participating in that meeting. Since 1924 the World Power Conference had grown into a great permanent international body, with National Committees in nearly fifty countries, representative of all organizations concerned with the development and the application of power. Everything had been done to make that meeting worthy of Germany and worthy of the World Power Conference. He firmly believed that the conference served a very great purpose in bringing together representatives of all nations, so that they might know each other better than in the past and live together in harmony in the future.

Dr. von Miller said he regarded it as a great honour to receive the Presidential Insignia at the hands of Lord Derby. He would hardly have dared to accept such a high honour as that now conferred upon him were he not one of the oldest of living engineers, who, as long as fifty years ago, began to develop the then little known water-powers of the Alps and the Carpathians, and who, by the establishment of the first long-distance power transmission lines from Lauffen to Frankfurt, took a share in opening-up whole districts and countries for electricity supply and for the transmission of power from one country to another. The power resources of the world, whether coal, oil, or water, were among the greatest treasures which Nature provided for humanity; and it was one of the most splendid tasks for the engineer so to exploit these resources that they might operate factories, railways, and ships, and supply light and heat to mankind.

A Luncheon.

On the same day, a luncheon had been given to the British accredited representatives by the Prime Minister. On his right sat Lord Derby, and on his left Sir David Milne-Watson.

Greetings.

The following message was addressed to the conference by the Patron—President von Hindenburg:

> I herewith tender Germany's greetings to the World Power Conference.
>
> From all parts of the world, from all countries of the globe, you have gathered here inspired by the one idea of mastering, more and more, in mutual effort, the forces of Nature, and of rendering them serviceable to the interests and progress of mankind.
>
> On its foundation, the World Power Conference was called the "Technical League of Nations." And nothing is, indeed, better calculated to league together the nations of the earth than a mutual endeavour of this kind to further the common weal.
>
> Interchange of thought promotes mutual understanding. Moreover, practical progress in the sphere to which your conference is devoted will always lead to closer relations between the nations. By developing the transport of power across the political frontiers, engineering is about to exercise greater influence than ever upon the economic life of the peoples and to establish a closer connection than ever before between their economic systems.
>
> You, as the leading workers in engineering, science, and economy, will, by your conference, bring about an appreciative co-operation between the governments and all the different factors of public life, and yourselves. The supply of power, light, and heat in ever new and improved forms will prove an effective means of animating economic activity; it will tend to reduce unemployment, and thus to counteract the difficulties under which the economics of almost all countries of the world are at present labouring.
>
> As honorary patron of this Second Plenary Conference, it therefore gives me particular pleasure to greet you here. Germany cordially welcomes you to her industrial centres, where the struggle for recovery has been particularly severe; she desires also to give you a lasting impression of what Nature and Art have conferred upon her in the way of beauty.
>
> With all my heart, I wish you success in your efforts—the success which the world expects from your endeavours!

Opening Session.

On the Monday morning there was a crowded attendance in the auditorium of the Kroll Opera House, where the opening of the business sessions took place. This, indeed, was not sufficiently large to hold anything like the number of members who had notified their intention to participate. Accordingly, numbered tickets were issued at the entrance, and these at the same time served as cloak room tickets—a trifle in the way of organization which prevented overcrowding at any stage of the proceedings. It was arranged that those who arrived after all the tickets had been distributed should be able to listen-in to the speeches by means of loud speakers installed in Hall I. of the conference buildings.

It may be noted here that those who had, by the Friday preceding the opening, signified their intention to take part in the conference numbered 3442. Of these approximately 250 were from England, almost the same number from America, and nearly 200 from Japan.

The scene in the Opera House was very impressive, when punctually at 10 o'clock a bell rang, and the orchestra took over the conduct of affairs. The stage was filled with prominent personages, and backed with tall shrubs; while overhead were banners remindful of the countries represented. During part of the time limelight beams were thrown upon the stage, and a dozen camera men were busy at work; but in Berlin there was none of the flashlight which proves a terror to so many diners-out in this country. Is the explanation of this difference to be found in the German camera? As used for such ocasions, it is a remarkable looking instrument—nearly all lens and legs, the body being reduced to insignificant proportions.

Dr. O. v. Miller was listened to in absolute silence. He was forceful, and one realized that he was a man who could create a great museum, such as he has done in Munich, where it is said that a complete inspection of the exhibits involves a walk of from eight to ten miles. The President was followed by Chancellor Dr. Bruning and Burgomaster Scholz.

Then came Sir Charles Parsons, as British Vice-President of the conference; and on behalf of the delegates from this country, he acknowledged the cordiality of the welcome to Berlin. They were, he said, participating in something more than an international meeting of members of certain professions. They were present as engineers and scientists determined to co-operate for the welfare of mankind. It was a conference independent of nationality. Each of the nations represented brought its own special message towards an international understanding.

M. Magnier spoke for France; and delegates from Poland, Russia, Scandinavia, North and South America, Africa, and Japan also addressed the meeting. Speaking for Canada, Dr. Charles Camsell (Department of Mines) declared that the World Power Conference had had remarkable success, and would undoubtedly go forward to increased success; while Dr.-Ing. Masawo Kamo (Professor at Tokyo University) pointed out that no industry could afford to disregard power. For Australia and New Zealand, hearty support was offered to any movement to forward the development and scientific application of power. The New Zealand Government had authorized their representative to say that they would continue to give the conference whole-hearted support, and that they looked forward to great achievement as the result of the deliberations.

After more music, the session terminated. Of all the speakers, one only had been inaudible to the vast audience, so efficient were the amplifying arrangements.

Technical Sessions.

On the Monday afternoon, Section 12, with Dr. Lander as Vice-Chairman, dealt with "Solid Fuels—Production, Trade, and Preparation;" the General Reporter being Prof. Dr.-Ing. P. Rosin. Those who took part in the subsequent discussion included Dr. R. Lessing Reference was made by speakers to the difficulty of arriving at a correct application of all the factors for sale by specification. It was urged that international agreement regarding the designation of various coals was essential. Simplicity should be aimed at, and the miner, the chemist, the analyst, and the salesman should meet together to find a solution of the difficulties. In a written communication, Mr. Harald Nielsen remarked that distillation processes must be so adjusted as to furnish the products in the most suitable form. The solving of the coal problem held out rewards which made it well worth while. In Europe, they were bound by dire necessity to find a solution.

Multi-Language Interpretation.

A novel feature of the sessions was the Siemens and Halske multi-language interpretation system employed. On taking a seat in the conference hall selected, the delegate found attached to the back of the chair in front of him a telephone instrument with headphones and a switch control releasing one of the three official languages—German, French, or English. There

THROUGH THE LENS IN BERLIN.

was also a volume control embodied in the instrument. A British delegate, when the speech was in French or German, put on the headphones, adjusted the indicator accordingly, and listened to instantaneous interpreting into his own language. When the speaking was in English, of course, he put aside the instrument altogether. Those desiring German or French translations were accommodated in the same manner. While experiences with these instruments—of which it is stated a thousand were installed in the halls—apparently varied widely, the writer was fortunate in his selection. The simultaneous interpretation, when dealing with technical subjects, and when the speaker had not previously reduced his remarks to writing, was, as might have been expected, more frequently the weaker link, and this may be said without any disparagement of the interpreters, who found themselves being frequently confronted with a practically impossible task.

A helpful idea was the illuminated indicator (on the same lines as those to be found on the underground railway) on which appeared the names of speakers who had signified their intention to participate in the discussion. An arrow pointed to each name as that particular delegate rose to speak.

The Physical Space and Ether Problem.

As many as could possibly obtain tickets attended that afternoon an address by Dr. A. Einstein, who concluded: "Summing up, we may say, rather metaphorically, space, brought to light by the material object, and made a scientific reality by Newton, has, during the past century, swallowed up both ether and light, and is now about to swallow up the field and corpuscles too, so that it will be left as sole theoretical representative of reality."

Reception by the German Government.

The proceedings on the first day were brought to a close with a reception by the German Government in the banquetting halls of the world-famed Zoological Gardens, which are no more than a short taxi drive from the centre of the city. In Berlin taxis are cheap, and very much used. There are great numbers of them, uniform in colour and style, and apparently uniform in the somewhat speedy manner in which they are driven. Signs for traffic regulation abound, and some of them are curious. There are gongs, and at some corners—doubtless those particularly patronized by taxi drivers—illuminated globes are let into the centre of the roadway so as to project only a few inches above the ground. These indicate the proper position in the road for traffic, and at the same time they are not vulnerable to the blows of erring drivers.

The reception was on a generous scale, and the throngs of guests had a thoroughly enjoyable evening—in the halls, in the illuminated gardens, or on the dance floor. A feature of the proceedings was an address of welcome by Dr. Curtius, Minister of Foreign Affairs.

Gas Sessions.

There was a good attendance again on the Wednesday morning, when Sir David Milne-Watson presided over the Section dealing with "Economic Problems of High-Temperature Distillation." The General Report was read by Mr. B. Ludwig, of the Berlin Gas-Works. A long list of speakers was tabled for the discussion, in the course of which Dr. Schütte described a plant for blending coal, effective mixing being secured by a worm screw arrangement. Numerous advantages have been secured by the operation of the plant. Dipl.-Ing. Thèodor Ploppa stated that at the Kiel Gas-Works dry quenching of coke has been practised for four years, and has proved successful; the quality of the coke being improved. It is a subject to which he thinks greater attention should be given. Mr. Walter Schweder stated that at the Magdeburg Gas-Works hot coke from the retorts is utilized for the manufacture of water gas. Mr. Borchardt dealt with the use of oxygen on a large scale, and the importance of securing cheap supplies. He has a test plant in which, by a certain process, he is producing oxygen at a very satisfactory figure. Dr. Karl Bunte alluded to the importance of carbon-monoxide free gas, but pointed out that the cost had to be taken into consideration. He explained a method by which carbon monoxide is completely transformed, and a non-poisonous gas results. Mr. Bertelsmann informed the meeting that in Germany there are, at the present time, 9,000,000 gas cookers, 2,000,000 water heaters, 1,500,000 irons, &c., and 500,000 room heaters. Dr.-Ing. Harald Kemmer spoke on the question of benzole extraction on an economic scale. German requirements of benzole are 390,000 tons a year, while the production of the gas industry is at present 30,000 tons. The gas industry could produce 50,000 tons a year, from which the German market would benefit. It would, therefore, be an advantage to the industry to pursue further production of benzole on an economical scale, and so reduce the quantity necessary to be imported.

In the afternoon Dr. Schütte was in the chair of the Section on "Gas Markets," the General Reporter being Dr.-Ing. Karl Lempelius, of the German Gas and Water Association. In the discussion here, Mr. Ramsin remarked upon the heavy capital expenditure entailed by long-distance gas transmission, and expressed the opinion that in the present state of the gas industry long-distance transmission is liable to be uneconomical. Therefore until the cost of long-distance transmission is greatly reduced, the competition of manufactured gas with solid fuels must be difficult. For producer gas and coke oven gas, the position is more favourable. Mr. Josef Orlopp declared that the gas industry has still great fields before it, if the proposition is based on the conditions of life in the houses concerned. The housewife who works has little time for household work, so that the labour-saving possibilities of gas hold out great opportunities. The consumption to be expected, of course, depends on the standard of living. It is necessary to do everything practicable, by installing cheap appliances, to introduce into working-class households water heating by gas. The real aim should be to provide cheaper and better apparatus. In all new buildings a point should be made of installing gas cooking arrangements.

Mr. Bertelsmann stressed the importance of supplying gas of constant quality, care being taken at the same time to maintain suitable pressure at the point of consumption. Mr. Paul Spaleck (Messrs. Junkers & Co.) said the object should be to provide gas as cheaply as possible, to compete with other fuels. Cheapness was also desirable to enable them to secure a demand to fill in the valleys in the load curve. Calorific values should be constant throughout the country, so as to permit of the use of standard apparatus. Better piping systems should be provided in new houses, adequate to meet all possible requirements. Mr. Walter Schweder expressed opinions favourable to the drying of gas, adding that equalization of the load should be striven after by introducing new uses for gas. He also made favourable reference to the use of waterless holders. Dipl.-Ing. Thèodor Ploppa dealt with the regulation of pressure. At Kiel, with 57,000 households, it is arranged to connect large consumers direct to the high-pressure mains; but there are low-pressure mains for the ordinary consumers, which are joined

Hot Weather on the Lakes.

to the high-pressure ones. The policy of the modern gas-works must be based on more elastic lines than hitherto. At Kiel, gas apparatus is fitted on agreement to pay for it in twelve instalments. The gas-works, however, do not undertake the work themselves. This practice has proved very satisfactory both to the gas undertaking and to those dealers from whom the consumers choose their apparatus.

Mr. Schomburg argued that regulation of pressure should be arranged in individual households, instead of providing regulators to cover the complete building. Mr. Hans Kämpe voiced the opinion that it is more economical to supply at moderate pressure in the mains, and then to put in individual boosters for trade consumers. Mr. Eecher said that the cost of installing household regulators would be very high, and their maintenance would be more expensive than that of district regulators.

World Power Festival.

The same evening provided the greatest social function of the conference, when about 3500 ladies and gentlemen assembled for the World Power Conference Festival. Berlin possesses halls which can accommodate with ease, and without any suggestion of crowding, such huge assemblies as were to be found both at the Government reception already referred to and at the Festival. The latter took place in the perfectly equipped Sportpalast, and so efficient was the organization generally that one felt even greater numbers could have been accommodated without confusion. The greatest of all "World Powers"—though not the one officially considered during the conference—was present in glorious profusion, and in dresses of various styles of beauty and in every imaginable hue. One realized that the Festival would have been sadly incomplete without them. As it was, with the bright dresses and the tasteful floral and banner decorations, the scene from the gallery of the palace was a captivating one when the proceedings were opened by a

fanfare of trumpets. This was followed by an address of welcome in these terms :

Hail to you all, men and women of this Power Conference, who have come hither from all points of the compass, from all parts of the world, from the vast domain of energy, "on which the sun never sets."

Fifty countries have gathered here in amity and conscious pride in the sign of the tapped and untapped sources of energy and power, in the sign of those forces of nature that are the very heart-beat of our civilization—oil, coal, steam, water, and electricity. To exploit and utilize these forces on an even grander scale, and co-ordinate them with the loftiest aims of mankind, and administer them with prudence and discernment, requires the force of personality. We all of us work in the service of this world power as its responsible guardians, to keep it within such bounds as may best safeguard the vital interests of this and future generations.

When the voices of friends and colleagues from beyond the seas are at this moment made audible to us on the swift wings of ether, we cannot but marvel at such a wonderful engineering feat of inventive genius. The voices tell us that they are one with us in aims and sentiments, and reveal to us, better than anything else could do, that the whole human race has been transformed into one great family through the medium of the ether for a better and lasting understanding.

This evening is to be devoted to friendly social intercourse alone, and not to operations on power problems. The power of song and music only shall to-night open ears and hearts of the participants in the Second World Power Conference.

These few fleeting hours of entertainment are meant to convey to our guests the gratitude and pride of this country for having been chosen as the seat of the congress.

Practically all dialects of Germany are reflected in speech and song to-night, just as different tribal traditions are seen here in the different native costumes. A warm heart with nothing but friendly feelings towards our guests beats in all of them, as showing that the whole of Germany stands here united in wishing the conference success and blessings for the benefit of mankind.

Ordinarily the sports palace is used for ice skating, cycle racing, &c., and so it was admirably adapted for the purposes of the Festival and of the entertainment which accompanied it. This included German folk songs, sung by 400 girls, members of the famous Berlin Choral Society (Liedertafel); exhibition of German physical culture by students and instructors of the Prussian High School for Gymnastics; and a living display of 700 national costumes and native dances from all parts of the country. Those who saw President Miller, with his dress coat removed, joining in the Bavarian dance, and the wild enthusiasm evoked, will long retain the scene in their minds.

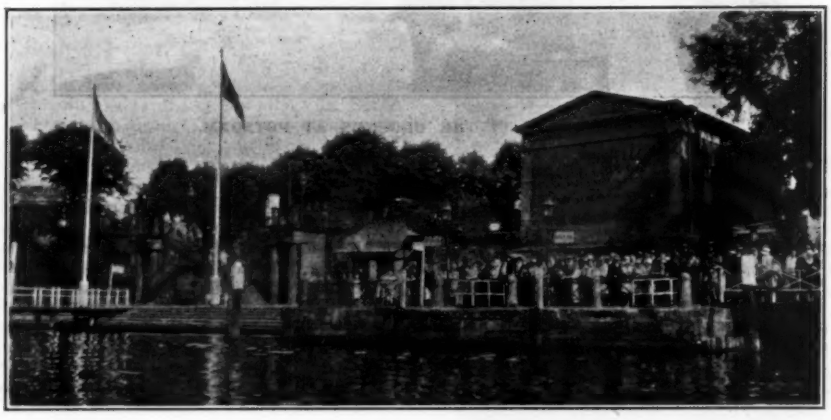
The banquet afforded an opportunity for a first attempt to establish simultaneous radio-telephone connection between Berlin, London, New York, and San Francisco. As the Festival began, the National Electric Light Association was meeting in San Francisco, and so for the first time an effort was made to bring into communication two separate congresses meeting in different parts of the world. The conversation was maintained on the German side by President von Miller and General Director Koettgen, and on the American side by Mr. Sloan (the President) and Mr. Owen E. Young. Also taking part in the conversation were Lord Derby (ex-President

HOSPITALITY IN THE GROUNDS AT POTSDAM.

A GROUP OF REFRESHED GUESTS.

of the World Power Conference) and Senator Marconi, who at the time were in London, and Thomas Alva Edison, in Oranje.

Technically the arrangements were that a four-way speaking connection Berlin-London was connected by long-distance cables with the wireless way London-New York. From New York to beyond Chicago there were long-distance cable communications, then wireless to San Francisco. Both at the terminals and at the intermediate points of this system there were branch connections to receive the conversations of persons who were not actually present at either of the conferences. The total distance of the system was over 11,000 kilometres. Over the whole distance speaking and listening systems were separate. At the meeting places both speeches and answers were conveyed by loud-speakers, so that all present could hear what was said. The experiment of this trans-oceanic conversation, which was relayed to all parts of Germany by wireless, succeeded beyond all expectations. Punctually at nine o'clock the American announcer (Mr. Carlin) introduced the speakers, and immediately afterwards the voice of Mr. Sloan was heard sending greetings to the World Power Conference, and expressing his pleasure that the third conference was to be held in the United States, where it was hoped to welcome many of those then present in Berlin. In reply, Dr. Koettgen, Chairman of the conference in Berlin, returned the greetings; and he was followed by Lord Derby in London, who emphasized the vast amount that power has done for our civilization in the way of increasing produce, raising wages, and improving the standards of life. Dr. v. Miller then spoke a few words, after which Senator Marconi joined in the conversation from London, stressing the importance of wireless in inducing a better understanding among the peoples of the world. Mr. Owen E. Young (Chairman of the Council of the N.E.L.A.) next spoke from San Francisco, and the programme concluded with a few words by Thomas A. Edison, speaking from Oranje. He spoke of the wonders of radio development, by which, although bodily far apart, men could be so quickly brought into communication, and expressed the opinion that in a few more years still greater success would be achieved. The conversation lasted in all about forty-five minutes.



POTSDAM LANDING STAGE.

Guests at Potsdam.

On Friday, June 20, in a fleet of about sixty motor coaches, more than 1200 members and ladies were the guests of the German Government at Potsdam. The weather remained magnificent, and a memorable afternoon was spent. After seeing the palace and park of Sans Souci (the favourite creations of Frederick the Great), the new palace was visited, and afterwards tea and other refreshments were provided in the grounds.

Gas in Berlin.

Members specially concerned with the gas industry found in Berlin many things to interest them. They learned with satisfaction that some 87 p.ct. of the street lighting (which is admirable) is by gas.

They were also informed that in the city there are already installed about 400,000 " Progas " consumers' governors, and that weekly no less than 9000 are added to the total.

Visits were arranged to various works, and included some of particular value to our industry. One evening, too, there was an informal meeting of delegates in the gas profession at the Zoological Gardens.

Among the functions was a dinner arranged by the International Executive Council and the foreign delegates, at the Hotel Kaiserhof, in honour of the German National Committee. This afforded an opportunity of publicly showing appreciation of the splendid way in which the conference had been organized, and of the generous hospitality extended.

From a Message by President Hoover.

The imagination is stirred by the ever widening field of knowledge and its practical application in the multiplying instruments of service to mankind. Civilized society depends in ever increasing degree upon the spirit of inquiry and that utilization of scientific truth. Those who serve this cause serve the best interests of the race.

The Fuel Conference in London.

The following is extracted from a report read at the closing session by Mr. F. zur Nedden, Joint Secretary of the German National Committee. This session was held under the auspices of the International Executive Council, by whom, it may be taken, the report was officially issued:

Of the four resolutions of the Fuel Conference in London, 1928, three are in the course of being carried out. The fourth regarding international regulation of the calorific value problem was brought to a final solution at a special meeting on June 20 during the Second World Power Conference. It was unanimously agreed that the World Power Conference should utilize all the resources at its disposal to induce everybody when giving data based on calorific value always to make it perfectly clear whether the upper or the lower (gross or net) calorific value forms the basis of such data. For this purpose (1) an official list of the terms used for the two values is being drawn up in all principal languages, as well as (2) international indices for both. These definitions and indices are to be published during the current year. The international standardization organizations mentioned above are to be requested to create an international standard definition for the upper and the lower calorific value.

The " Transactions."

On the present occasion there is to be some change in the form of publication of the " Transactions " of the conference. Instead of being contained in a few large volumes, they are now to be issued in twenty-one volumes, which will be purchasable separately. For example, Vol. II. will deal with "The Production and Use of Gas," and, consisting of approximately 600 pages, will be published at £2 (pre-publication price £1 10s.). There are, of course, other volumes which will also prove of interest to " Journal " readers, and the prices of which vary. Two volumes will be dedicated to those who desire to obtain merely a comprehensive survey of the work of the conference. This desire will be largely satisfied by perusal of the thirty-four general reports, which contain the important points brought out in the individual papers. One volume will embrace the reports (in German, English, or French), and the second will consist of an index.

PAPERS AT THE W.P.C.

Effect of Legislation and Control by Public Bodies on Gas and Electricity Supply

The General Report on this subject states that, following a period shortly after the war, remarkable in most countries for the volume of electricity supply legislation, activities in this direction have to a large extent ceased, except with regard to legislation connected with the winning of natural resources and, in particular, the exploitation of water powers, since it was recognized that a certain consolidation of technical conditions and organization in questions of supply had automatically occurred due to economic needs. During this period of relative immunity from legislation and Government regulations the initiative of individual undertakings gradually matured, quite independently of the fact of whether they were privately or State-owned or who administered them, with the result that present conditions compare very favourably with those obtaining before the war. In most countries the number of active supply undertakings has decreased owing to the suppression of small companies, while the capacity and development of supply areas have greatly increased; the quantities of gas and electricity produced have increased even more, and may be assumed as likely to increase still further, if we disregard unavoidable set-backs due to unfavourable market conditions.

Legislative influence on the supply of gas would appear to obtain in Great Britain only. The form of State intervention in the supply of electricity is different in the individual countries and varies between the exercise of purely supervisory functions and strict control by making it necessary to obtain official sanction for building new power stations and lines or for extending existing ones. General schemes have been drawn up in various countries, while in others schemes have been promoted for obtaining as uniform and cheap conditions of electrical energy supply as possible. In such cases individual undertakings are required at least to observe tacitly the programme, where this is not actually obligatory in certain cases. In view of the very diverse technical and economic nature of the conditions prevailing in individual countries, no definite pronouncement can be made as to the trend of future development.

The Nature and Extent of Public Control of Gas Undertakings, and the Effect of Such Control upon their Economic Operation and upon the Economic Relations between Consumer and Supplier in Great Britain.

(National Gas Council.)

By T. P. Ridley.

The gas supply at the present time is provided by 774 statutory undertakings selling 282,500 million c.ft. per annum, and about 600 non-statutory undertakings selling 7500 million c.ft. —a total of 290,000 million c.ft.

The numbers of consumers and the sales of gas by statutory gas undertakings are divided between municipalities and companies in the following proportions:

The following is a grading of undertakings into quantities of gas sold per annum:

No. of Undertakings.	Quantity of Gas Sold per Annum.
620	Under 250 million c.ft.
65	250 to 500 ,, ,,
42	500 ,, 1000 ,, ,,
40	1000 ,, 5000 ,, ,,
7	Over 5000 ,, ,,
774	

Municipal Undertakings.

The figures in the first table indicate that the companies have developed sales to a greater extent than the municipalities, and "Field's Analysis" shows that the percentage of increase in sales of gas by undertakings tabulated therein from 1907 to 1928 has been: Provincial Companies 72 p.ct., municipalities 49 p.ct.

A large number of municipal undertakings have been acquired by purchase as authorized by the Public Health Act, 1875, s. 162. In some cases terms were settled by agreement and in others by arbitration. Since 1910 the desire on the part of ratepayers to become owners of gas undertakings has been very limited. The probable reasons are (*a*) that large numbers of municipalities have become suppliers of electricity; and (*b*) that since 1910, the gas undertakings feeling electrical competition keenly have been much more progressive and have given better service to the public.

Parliament will not force a company to sell its undertaking unless there is strong evidence that there is maladministration. The terms of transfer of statutory undertakings, whether by agreement or arbitration, have varied from about 15 to 30 years' purchase of the profits, the majority ranging from 20 to 25 years.

Municipalities are generally able to raise capital at a lower cost than companies owing to being able to offer better security. They are compelled, in addition to paying interest on capital, to pay sums yearly into sinking funds to redeem the capital raised, and consequently, after a period of years, have a less amount of outstanding capital debt than companies, who are not under a similar obligation. In fact a few undertakings have redeemed the whole of their capital debt.

"Field's Analysis" shows that, in 1883, for the ten Provincial Companies then tabled in the book, the average capital expenditure per 1000 c.ft. was 12s. 3d. and the average outstanding capital debt of the eight English municipalities shown was 12s. 7d.; in 1928 the figures were 8s. 6d. and 5s. 6d. respectively. The average charges for capital in 1928 for the undertakings shown in the analysis were: Companies 6·90d. and municipalities 7·11d. per 1000 c.ft. The net receipts for gas, however, in the same year were for the companies 34·98d. and the municipalities 40·25d. per 1000 c.ft. of gas sold.

Many municipalities allocate part of their profits to the relief of local rates, though this is becoming less general in number and amount. In 1928 some of these allocations represented

Number of Undertakings.	Number of Consumers.		Annual Sale of Gas in C.Ft.			
	Total.	Per Undertaking.	Total.	P.Ct.	Per Undertaking.	Per Consumer.
319 Municipalities	3,400,000	10,658	101,500,000,000	36	318,000,000	29,853
455 Companies	5,400,000	11,870	181,000,000,000	64	398,000,000	33,520
774	8,800,000	11,370	282,500,000,000	100	365,000,000	32,102

Comparison of Company Undertakings.

—	Number of Consumers.		Annual Sale of Gas in C.Ft.			
	Total.	Per Undertaking.	Total.	P.Ct.	Per Undertaking.	Per Consumer.
194 Maximum dividend	996,000	5,134	31,000,000,000	17	160,000,000	31,124
261 Sliding scale and basic price	4,404,000	16,873	150,000,000,000	83	575,000,000	34,060
455	5,400,000	11,870	181,000,000,000	100	398,000,000	33,520

2½d. per 1000 c.ft.; sixteen years ago there were cases of double that rate.

All Classes of Undertakings.

There has been great development in the quantity of gas sold and the numbers of consumers supplied by all classes of undertakings, thus indicating that the industry as a whole has given good and popular service, as is shown by the following table relating to all statutory suppliers:

—	Gas Sold (Millions).	No. of Consumers.
	C.Ft.	
1883	68,270	1,979,481
1893	99,212	2,400,254
1903	147,702	4,230,721
1913	201,595	6,917,747
1923	241,627	7,810,350
1928	282,500	8,800,000

There are over 7,000,000 gas cookers (mostly on hire from gas undertakings) and 10,000,000 gas fires (also mostly on hire) on consumers' premises, and on the streets there are between eight and nine hundred thousand public lamps.

With regard to the price, which is the consumers' test of the successful economic operation of an undertaking, the following statement shows the approximate gross average prices for gas in London at various periods:

—	Gas Light and Coke Company.		South Metropolitan.		Commercial.		Approximate Cost of Second Class Durham Coals. f.o.b.
	Per 1000 C.Ft.	Per Therm.	Per 1000 C.Ft.	Per Therm.	Per 1000 C.Ft.	Per Therm.	
	s. d.		s. d.		s. d.		s. d.
1815	15 0	..	..	..	..	..	..
1829	12 0	..	..	..	..	..	5 6
1849	6 0	..	..	..	..	..	5 6
1873	4 4	..	3 0	..	4 0	..	16 0
1883	3 1½	..	2 10	..	2 10	..	7 0
1893	3 1	..	2 5½	..	2 9	..	7 6
1903	3 0	..	2 3	..	2 6	..	9 0
1913	2 6	..	2 2	..	2 4	..	12 6
1923	3 9½	9·1d.	4 0½	8·625d.	3 9½	9·6d. (*a*)	23 0
1929	3 7	8·6d.	4 1	8·75d.	3 9	9·0d. (*b*)	14 6
Declared calorific value (B.Th.U.)		500	..	560	..	475 (*a*) 500 (*b*)	..

Notwithstanding increases in the prices of coal there was a general decrease in the price of gas to the date of the war, and to-day prices generally are lower than in 1923. The prices throughout the country run in similar manner.

In at least one case in the Provinces the price to very large consumers is as low as 1s. per 1000 c.ft.

With regard to shareholders, the rates of dividend paid to holders of ordinary stocks have increased, and at the same time the total charges for capital per 1000 c.ft. of gas sold have decreased. The following statement of capital costs per 1000 c.ft. of gas sold as to the Metropolitan Companies is a reflection of the whole country:

—	Gas Light and Coke Company.	South Metropolitan.	Commercial.
	d.	d.	d.
1883	15·56	14·25	12·54
1893	13·82	11·64	11·29
1903	12·36	8·0	9·69
1913	10·93	7·53	9·06
1923	10·03	8·17	9·31
1928	9·05	8·42	9·13

The gas industry is an important one from the national financial point of view as the following approximate figures show:

Capital invested in works and plant	£180,000,000
Employees (average)	100,000
Annual sum paid in local rates	£2,500,000

In addition it pays large sums in respect of Imperial taxation.

In the past too much protection has been provided for the small consumer, with the result that he does not pay his fair proportion of costs. There are many items which are the same in amount whatever the consumption may be. By an examination of the records by one undertaking it has been found that nearly 90 p.ct. of the whole of the consumers are not paying their full share of charges, which, of course, means that the balance representing large and mostly industrial consumers are carrying unfair burdens. The gas undertakings in many cases are therefore severely handicapped in competing for industrial business which economically should be theirs. The industry feels that it should be given greater freedom in its methods of charge, and that all undertakings should be allowed to pay a minimum dividend as has been granted in the case of basic price companies irrespective of the price which may be charged for gas, so as to strengthen the values of stocks and thus cheapen the cost of new capital.

It is also felt that there should be greater facilities for undertakings to enter into working arrangements with each other; and, as sinking funds are not prescribed for companies to redeem their capital expenditure, they should be empowered to build up larger special purposes, renewal, and reserve funds.

The industry is, however, looked upon by the public as the most enterprising of the old public utilities. It endeavours to give satisfaction to every consumer by encouraging them to intimate to the undertaking when the gas supply or any appliance is not giving satisfaction. Some of the undertakings send periodically to every consumer's premises to examine and overhaul all gas appliances whether hired or owned by the consumer without any direct charge.

Its co-operative advertising is the envy of many other industries, and every undertaking has at least one showroom, and the larger ones at the rate of about one for each 1000 million c.ft. of gas sold per annum.

Its relations with its employees are excellent, and there are more profit sharing schemes in operation than in any other industry in the country. In a few cases employees are represented on the directorates. There have been many amalgamations for more economic administration during the last few years, and there are prospects of further amalgamations.

The uncontrolled supply of gas in the early years of last century was wasteful and unsatisfactory to suppliers and consumers. The fact that the undertakings have developed so much and are so virile to-day shows that the effect of public control upon the operation of gas undertakings and the relations between supplier and consumer in Great Britain has been beneficial to both the undertakings and the consumers.

Gas undertakings are in practice regulated monopolies, but the severe competition of suppliers of other commodities which perform similar services afford the greatest possible protection to the consumer.

Gas Markets

The General Report summarizes the trend of development as follows: The total impression which the papers convey is that of extremely active development of the gas industry pursued with the greatest zeal. All the different kinds of gas, such as coal gas, natural gas, carburetted water gas, oil-gas, and producer gas in particular, are winning greater and more extensive markets in countries where production of particular gases can be facilitated. The characteristic feature of this expansion is the enormous extension of long-distance pipes which is made possible by concentrated supplies of natural gas. It is used now from the Gulf of Mexico to the Great Lakes and almost to the coast of the Atlantic in an inter-connected network of pipes. Protection of this network against corrosion is an important problem which is being scientifically and practically investigated. Plans of considerable magnitude for extending the pipelines are being carried out just as in England in the case of coke oven gas, and even more so in Germany, where the gas-works more and more resemble coke producers in their methods of operation. The highest degree of total economic efficiency is being sought in gas and bye-product recovery. Storage and transport of gas in cylinders have also had considerable success.

The transfer from solid fuel to gas is extending not only in the household and public buildings, but in a large number of industries, every branch of which is the subject of special studies in gas utilization. The advance in civilization which gas makes possible by counteracting the extremely troublesome smoke and soot nuisance and the enormous losses caused thereby, as demonstrated by statistics, is a point of view which, together with the economy of gas consumption, is brought to the fore.

Attempts are being made in the most enthusiastic manner to increase the economy of gas consumption by investigations on the most advantageous composition of gas and the most useful high pressures in the pipelines which are now being appreciably increased; these higher pressures are then reduced according to the requirements of the individual consumer. The most varied suggestions are made, according to local conditions, to influence the sale of gas so that the consumption factor may become more uniform throughout the year. Systematic propaganda to this end is in progress everywhere, and aims at giving the consumer counsel and hints for making his appliances conform to the requirements of his business. In order to induce greater gas consumption by the public, the best methods of fixing gas rates are being everywhere considered. The effect of different kinds of consumption on the load of the gas-works is tested in this connection, and no hesitation is apparent in utilizing complicated rate schedules which will as far as possible take into consideration the needs of every category of consumer.

One obtains the impression that the increase of all these in-

vestigations and of successes recorded is greater than ever before, and that a discussion and exchange of experience on the principal points which are recognized as such in the different countries will be of very great advantage.

Principles of Design, Construction, Operation, and Testing of Domestic Gas-Heating Equipment.

(Joint Fuel Committee.)

By J. W. Wood and G. B. Howarth.

Introduction.

The use of gas for domestic cooking and heating is rapidly extending. In England alone, it is estimated that the consumption of gas for purely domestic purposes has reached 200,000 million c.ft. per annum, necessitating carbonization of more than 13 million tons of coal annually, and the subject is, therefore, worthy of serious consideration by the World Power Conference.

General Requirements for Gas Appliances.

In order that manufacturers may display individuality in their products, and that progress in design shall not be hindered, it is unwise to draw up rigid specifications for gas appliances. Certain general requirements must, however, be observed:

1. The normal thermal output must be sufficient to enable domestic heating operations to be carried out satisfactorily and in a reasonable time. Typical figures from current British practice are as follows:

—	B.Th.U. per Hour.
Boiling burners	7,000— 10,000
Ovens (During heating up)	10,000— 15,000
Ovens (During cooking)	4,000— 7,000
Geysers	60,000—120,000
Gas fires (per radiant)	2,000

2. A high theoretical efficiency in use must be secured. This is necessary on account of the relatively high price of gaseous heat units; but is rendered practicable by the ease with which the fuel can be controlled. As the same domestic appliance may be called upon to work over a considerable range of thermal output, it is desirable that its gas-rate-thermal-efficiency curve should be a flat one—*i.e.*, the thermal efficiency should be approximately the same for a reasonable variation of gas rate and operating conditions. Boiling rings are regularly obtainable with a thermal efficiency of 40 to 50 p.ct.; geysers with 75 to 80 p.ct.; gas fires with a radiant efficiency of 40 to 45 p.ct.; all based on the gross calorific value of the gas.

3. Safety in operation is an essential feature and may be considered under a number of headings:

(*a*) Permanent gas connections are always preferable to rubber, metallic flex, or other flexible tubing.

(*b*) The gas cocks must be well finished and have ample bearing surfaces. "On" and "off" positions, and the burner to which the cock belongs must be unmistakably indicated, and there must be no chance of cocks being turned accidentally—*e.g.*, by projecting handles catching in clothing.

(*c*) Burners must light and extinguish with certainty and without undue noise, whether a light is applied immediately after turning on the gas or after a brief delay. Pilot lights in particular should be protected from draughts, and should light the main burners with certainty. In Germany safety devices have recently been developed which incorporate pilot lights and bi-metallic springs controlling valves on the gas supply to the main burner; these cut off the gas should it fail to light or for any reason be extinguished.

(*d*) Turning down a cooker burner to one-quarter of its normal gas rate should not cause back-firing or produce luminous flames.

(*e*) In the case of cookers, pan-stability is important, and the possible extinction of the flames by food boiling-over must receive attention.

(*f*) The character of the products of combustion must be carefully investigated, especially for overload conditions, where smothering and the production of carbon monoxide are likely to occur. As every contingency cannot be provided for in this connection, safety can be greatly increased by effective schemes for the instruction of the user as to the correct way of regulating appliances.

(*g*) Fire risk must be eliminated.

4. Simplicity in adjustment and operation is a most important feature, and must be secured even if it entails some slight loss in thermal efficiency. The ease and certainty with which burners can be dismantled and re-assembled will considerably influence the frequency with which they will be inspected and, if necessary, cleaned. This will in turn have its influence upon the general cleanliness of the appliance, its thermal efficiency, and its useful life. The present fashion for enamelling parts of cookers will have a similar effect, and the enhanced appearance may result in their being treated with greater care.

5. All parts of gas appliances must be of sufficiently robust construction to withstand reasonable wear and tear. Accuracy of construction is of importance for securing high thermal efficiency and the successful working of any system of interchangeable parts. The extended use of gas appliances is also dependent upon their being marketed at an economic price.

Combustion and Aeration.

The first work of the Joint Research Committee was to study the behaviour of different grades of gas in typical existing appliances, with special reference to the calorific value and percentage of "inert" constituents (nitrogen and carbon dioxide) in the gas. The most noteworthy conclusion from the first three reports of the Committee is that if the same number of heat units are supplied, the thermal efficiency in use is independent of the calorific value and inert-content of the gas within surprisingly wide limits, provided that the gas nipple and air-shutter are suitably adjusted. This clearly dispenses with the necessity for a uniform standard of gas quality for the whole country. By far the greater proportion of gas manufactured has a calorific value of 450 to 500 B.Th.U. gross per c.ft., and British appliances have been evolved to give excellent service over this range.

As already indicated, gas appliances should be designed for a definite working thermal output, and the requisite gas rate is easily calculated when the calorific value of the gas is known.

Products of Combustion.

The production of CO by unobstructed flames, whether of the luminous type (flat flame and Argand) or of the bunsen type, is extraordinarily small, rarely exceeding 1 part per 10,000 of gas burned. On the other hand, in many appliances the flame is necessarily brought into contact with a solid, and in such cases a higher CO production is commonly observed.

In general, the CO production of a properly adjusted gas appliance may be kept below 10 parts per 10,000 of gas burned, but it increases slowly with gas rate up to a certain point beyond which the further increase is very rapid. On this account it is advisable to test appliances at a sufficiently high gas rate to ensure that the CO production will not increase unduly if the normal working rate of the burner is somewhat exceeded. CO production falls as primary aeration increases unless the extra aeration gives rise to rough and noisy flames. Primary aeration frequently increases with gas rate, and this may mask or modify the increase of CO production with increasing gas rate.

A high carbon monoxide output is sometimes traceable to distorted and irregular flames, such as occur, for example, when geyser burners are worked at too high a pressure. A pan of water placed over a flame causes a noticeable but not serious increase in the CO production. By far the most serious causes of high CO production in the case of cooker hotplates are the cutting of the inner cones of the flames by the pan, and the use of unsuitable pan-bearers which hinder the access of secondary air and the free exit of products of combustion from around the pan bottom. There is reason for believing that an unduly high concentration of carbon dioxide in the neighbourhood of the flames favours an increase in the CO production.

The immersion of a solid in the flame, as in a gas fire, leads to a material increase in the CO production. In view of the nature and quantity of the products of combustion from a gas fire, they are not allowed to escape into the room, but are always removed by a flue in modern installations. The griller provides another example of flame-contact, and it is found that the correct placing of the grill-frets with respect to the flames is a most important matter if the production of CO is to be kept satisfactorily low.

Gas Cookers.

The bunsen burner has been dealt with in some detail, and other features of its application to gas cookers will now be indicated.

Hotplates.—The most marked tendency of modern design is in the direction of smaller and more efficient burner heads. Many makers still retain burners with vertically or obliquely drilled flame-ports about ⅛ in. (3 mm.) diameter, but burners from which the flames emerge nearly horizontally are coming into extensive use, with a much reduced distance (about ¼ in.—6 mm.) between burner and pan. Unsuitable pan-bearers can cause serious reduction in the thermal efficiency of good burners, and great pains have been taken by makers to replace old and heavy types with lighter ones offering less obstruction to the flames and freer outlet for the products of combustion. Some of these have failed on account of fragility and lack of pan-stability and have been withdrawn. Solid tops for hotplates were condemned as inefficient by the Bureau of Standards, but both British and American cookers are available with semi-solid tops, in which a small amount of thermal efficiency is admittedly sacrificed for convenience in use.

Ovens.—In the usual type of construction the oven serves as the support for the hotplate. This secures compactness, but there is now a tendency to raise the oven to a more convenient

working level, and, especially in America, to place the hot-plate at the side of the oven. Generally speaking, German manufacturers make greater use of stampings than English manufacturers, and their appliances are, therefore, lighter than where castings are used. The use of white enamel for the exterior of cookers is now being extensively adopted.

Efficiencies have been greatly improved in recent years by suitable lagging and by reduction of the flue-losses. Models have been produced in which the products of combustion leave the cooking chamber and circulate between the inner and outer casings. In others the excess air is reduced to a minimum by allowing the products to leave the oven near the bottom, the fresh air being admitted close to the flames. Thermostatic control of the oven temperature is now offered by several firms, but the use of thermostats cannot yet be considered as general. One curious effect of the greater efficiency of the modern oven is the difficulty of burning the smaller amount of gas with the two burners which in the older designs were conventionally placed one on each side of the oven, and models are now produced with only a single oven burner. Gas ovens are generally allowed to discharge their products of combustion directly into the room.

Water Heaters.

There are many water heaters on the market with a thermal efficiency of more than 75 p.ct. Most of them employ luminous flames. The rate of gas consumption in geysers is greater than for any other domestic appliances, and as they are frequently installed in small bathrooms and sculleries, provision for their safe operation is of the greatest importance. It should not be possible to turn on or light the main burners until the water-flow is established. In automatic types the opening of the water-delivery tap creates pressure differences in the water system which act upon a diaphragm attached to the gas-valve spindle. In non-automatic types interlocking gas and water taps are provided.

The examination of the products of combustion is most important, for the gas rate must be kept below that at which smothering takes place and carbon monoxide is produced in dangerous amounts. Generally speaking, this test should be made without the use of a flue-pipe, although some workers recommend 2 ft. (60 cm.) of flue-pipe, and the Joint Research Committee examined a geyser for which 3 ft. (90 cm.) of flue-pipe was essential, unless the gas rate was to be considerably restricted. The unsteadiness of flames due to using flat-flame burners at too high a pressure, or with too great a draught through the combustion chamber, was also found to be conducive to carbon monoxide production. In practice a geyser must be connected to a flue for the removal of the products of combustion, and this must be provided with a suitable terminal or cowl. The appliance must be fitted with a baffler to protect the combustion chamber from the influence of down-draughts, and this baffler must vent freely into the room in which the geyser itself is placed. In England the baffler is generally an additional fitting, but German and American manufacturers more frequently include the device as an integral part of the geyser construction. Systems have also been proposed in which the air-intake, combustion chamber, and flue constitute an enclosed system, and thus prevent the entry of products of combustion into the room.

Condensation of water vapour from the products of combustion may lead to corrosion, troublesome stoppages, and inefficiency, and is particularly objectionable in automatic heaters subjected to frequent use. One German firm fits a preheater block, so that the incoming water is raised above the dew-point temperature of the flue gases before the heat-exchanger proper is reached, and condensation is thereby avoided. Some water companies will not permit geysers to be subjected to the town water pressure, and their objections are met by installing low-pressure appliances with a break in the water system. The by-pass consumption on some geysers is far from negligible, and the use of single pilot-lights and flashing by-passes is recommended.

In addition to the types mentioned, there are gas heaters attached to storage tanks which are drawn upon as required. The tanks are well insulated thermally, but the rate of recovery after drawing off hot water is frequently too slow. They are controlled by thermostatic devices. Central heating systems circulating hot water from gas-fired boilers are exceptional on account of cost, and coke-fired boilers are more commonly used for this purpose.

Methods of Encouraging the Use of Gas in Industry.

(Joint Fuel Committee.)

By E. A. Leask.

Effects of Coal Smoke.

The importance of the manufacturing load to gas undertakings is fully appreciated, and I propose to describe the methods adopted in Leeds to extend the use of gas in industry.

Industrial Gas Appliances Department.

It has been found desirable to separate entirely the industrial work from the domestic side, and to control from a separate department all trade appliances, including furnaces and heat treatment work, manufacturing operations, special cooking apparatus for hotels, cafés, and workpeople's canteens, equipment for hospitals and institutions, heating of large buildings, and any special work which does not come under the heading of domestic apparatus.

Demonstration Rooms.

The demonstration department is an essential feature of the work, and upon this section the success of the business very largely depends.

In selecting equipment for demonstration one must be guided by the type of industry prevailing in the district. In one of our demonstration rooms are fitted furnaces for hardening, annealing, case hardening, general heat treatment, lead baths, salt baths, oil baths, brazing hearths, welding apparatus, ovens for enamelling, pottery, firing, rivet heating, forging, &c., also metal melting furnaces.

Gas may be used at pressures from 2½ in. to 31 lbs.; and air is available from a fan at 6 in. pressure, and from a rotary compressor up to 5 lbs. Natural draught furnaces are usually recommended for work up to 1000° C., and we have an air-blast furnace which reaches 1700° C. Pyrometers and instruments for hardness testing are necessary items in the equipment; we find gas flow indicators very useful, as they indicate at sight the gas consumption per hour of the apparatus being demonstrated.

Salesmen.

The industrial salesman must be equipped with technical and practical information, and must have had a sound engineering training. He must have a complete understanding of the various fuels available, and the factors that affect the efficiency of utilization. In industrial heating operations the main consideration is not necessarily fuel cost. The following are some of the selling points for town gas in connection with furnace work: No fuel preparation; furnace ready for use by opening a valve; heating value is high; gas may be burned efficiently; high temperatures are readily attainable; accurate temperature control; perfect control of furnace atmosphere; uniform quality of product; plant may be kept clean without difficulty; low cost of furnace maintenance; labour cost is low; scaling of heated articles can be avoided; reduction in materials spoilt; improved quality of product; increased output, &c.

Salesmen should know the details of the various industrial operations, so that when they approach a prospective customer, they are in a position to talk his language. It may seem difficult, if not impossible, to be acquainted with all the trades in a manufacturing district; but in Leeds we have a well equipped commercial and technical library, where trade books and periodicals may be consulted as required, and the technical salesman has an opportunity of keeping his information up-to-date by consulting the latest literature concerning manufacturing processes. Being in possession of up-to-date information is a great advantage when approaching a prospective customer. The work of an industrial salesman is always interesting, and his education is never complete.

New Buildings and Alterations.

In the case of new buildings or alterations it is essential that we should get in touch with the proprietors before the internal equipment is definitely decided upon. We are in a position to obtain early information. The plans are, of course, first deposited with the Building Committee of the Corporation for sanction. The City Engineer kindly sends to the General Manager of the Gas Department a list of the proposed new buildings and alterations, together with the names of the architects and proprietors. This early information is useful in arranging for gas mains and services.

Without having a definite inquiry the salesman has now some ground on which to work, and, knowing the nature of the trade to be carried on, he prepares himself accordingly. At this stage the prospective customer is usually very willing to discuss new methods of heat treatment which are likely to make for increased efficiency. If gas appliances have not been largely specified, an opportunity is afforded of pointing out their various advantages, and indicating the saving that can be effected in flue construction, floor space, &c.

Preferential Charges for Gas.

The average consumption of gas by the industrial furnace user is many times greater than that of the domestic customer, and a preference has been given to certain specified trade purposes. Furnace users are charged 2s. 3d. to 3s. per 1000 c.ft., according to quarterly consumption, which is equal to 5·74d. to 7·66d. per therm. For other heating and lighting operations the charge is 3s. 3d. to 3s. 9d. per 1000 c.ft., equal to 8·30d. to 9·59d. per therm. The accounts rendered bear a discount of 5 p.ct. for prompt payment.

While the price of gas will always have a bearing upon the amount of business that may be obtained, there are many in

dustrial heating operations where the fuel cost is not the main consideration. Efficiency of apparatus, regularity of output, and quality of product have a considerable cash value, although difficult to estimate accurately. Although solid fuel is frequently available at 1d. per therm, the conversion to gas firing is making steady progress, and as the price of gas is reduced so will the change-over be speeded up.

Industrial Survey.

The preparation of a complete list of industrial appliances in use serves a very useful purpose. Interviews are readily obtainable with the managers of manufacturing firms, and full particulars of the gas apparatus is entered upon a card. On the back of the card is a continuation of the columns of particulars.

This card system now covers every gas appliance in Leeds which is entitled to furnace rate. The information obtained is exceedingly useful, showing exactly in what processes town gas is used, and indicating the ground for further extensions.

The preparation of this census was fruitful of much new business. While obtaining particulars of the gas apparatus we were able to find also the extent to which solid fuel was used. While there are some solid fuel operations which may be regarded as beyond the reach of town gas, there is a very large amount of heat treatment work in which the special advantages of gas fuel considerably outweigh the difference in cost.

A second card entitled " Prospective Orders for Industrial Appliances " was then brought into use.

Demonstrations for Individual Firms.

The following up of prospective orders requires very careful consideration, and this is where the utility of a demonstration room is fully appreciated. The method is to prevail upon the customer to have some of his work heat-treated in our department, and for his staff to see the operation carried out. Special care is of course taken with demonstration work, and visitors are invariably favourably impressed. Customers frequently get the demonstration habit, and new problems and schemes are tried out in our department. The variety of apparatus and instruments available encourages visits of this nature.

Our object is of course the extension of the use of gas. One particular engineering firm has had a large number of demonstrations, and without extending its works, the following is the progress in the consumption of gas, displacing solid fuel.

Year.	
1927	4,930,300 c.ft.
1928	8,034,900 ,,
1929	16,377,300 ,,

Demonstrations for Trades.

A limited period may be set apart for demonstrating the heating operations in a particular trade.

Some of the old established firms are reluctant to change their methods, but in a trade demonstration some will always be found who appreciate the advantages of a change from solid fuel to gas firing, and some definite business is always available. Also a liberal number of cards may be filled up as " Prospective Orders " to be followed up later.

Case hardening of mild steel in closed boxes is one of the most popular heat treatments in engineering practice, and a large number of gas-fired furnaces have displaced solid fuel for this purpose.

A re-heating furnace giving an even and constant temperature is highly appreciated by engineers. In re-heating steel articles after carburizing an uneven temperature will cause distortion on quenching.

Gas and air-blast ovens are also used for case hardening work. They are of stronger construction than the natural draught type, and consequently will stand more wear and tear. Also the required temperature is reached more quickly. For heating small machine parts on trays one must have a non-oxidizing atmosphere. The gas furnace is admirably suitable for this purpose.

So much depends upon the spring work of motor cars, &c., that the heat treatment in the manufacture of the springs is highly important. Solid fuel has largely given way to gas firing in order to obtain correct results.

Although solid fuel is still largely used for this process, there have been many conversions to gas firing, with satisfactory results. In the case of expensive metals, the convenience and cleanliness of gas firing is appreciated, and the cost of the fuel is a minor consideration. A " goldbeater," an old established business, was found to be using coke for melting his precious metal. He was persuaded to bring some scrap gold to our demonstration room. A small crucible furnace was used. By the speed and cleanliness of the operation there was no difficulty in obtaining the order for a gas-fired furnace.

The low-temperature work of enamelling is conveniently and efficiently done by town gas. The largest oven we have erected of this type is 30 ft. long, 18 ft. high, and 6 ft. wide. It is used for baking the enamel on all-metal aeroplanes. The flue outlets are at the bottom of the oven, and even heating is obtained.

Many operations require a constant temperature in order to give a regular and speedy output. In the manufacture of bolts and nuts, shop fittings, and small articles of a repetition character, gas-fired furnaces are much appreciated. Also in the heavier work of locomotive construction gas has displaced solid fuel with satisfactory results.

Food Production.

Mass production of food may be regarded as an industry. As an example we will take the cooking of fish and potatoes. Quite a number of shops are devoted entirely to this, and over 200 of them are now using gas in Leeds. This is more than 50 p.ct. of the total number of such shops. Gas is now exceedingly popular for sugar boiling, chocolate making, &c. We always work on the principle that the most efficient appliances should be recommended, and we are out to save gas wherever possible.

Steam Raising.

The gas-fired boiler is frequently used where steam is required in comparatively small quantities.

On a test taken in a boiler 3 ft. internal diameter by 4 ft. 6 in. between tube plates, suitable for evaporating 300 lbs. of steam per hour at a pressure of 80 lbs. per sq. in., the following results were obtained:

Feed water temperature	42° Fahr.
Steam gauge pressure	97 lbs. per sq. in.
Evaporation	321 lbs. per hour.
Calorific value	470 B.Th.U.
Gas consumption	1000 c.ft. per hour
Flue gas temperature	466° Fahr.
Efficiency	80·8 p.ct.

The saving of space and cleanliness are valuable assets to the gas-fired steam boiler.

Baking.

In the baking industry gas now plays a prominent part. The small shopkeeper is readily convinced of its utility, and we have also satisfied some of the large bakehouses with the advantages of gas firing. The conveyor type of oven is frequently used, and we have several from 30 to 70 ft. in length. One 70 ft. oven has been used solely for bread baking for the past ten years. When fully charged it holds 1000 loaves, and the speed of the conveyor is adjusted so that each loaf is in the oven 57 minutes. The oven works day and night, and accounts for a gas consumption of 7 million c.ft. per annum.

Hotel and Cafe Kitchens.

In special cooking appliances gas firing is in a very strong position, and a great variety of appliances are available. In developing this side of the business, it is again advisable to give practical demonstrations.

In installing appliances it is found to be advisable for the gas department to undertake the whole of the work in connection with commercial apparatus.

Construction and Operation of Large Power Plants

Mains and Cables in Highways.
(Joint Fuel Committee.)

By Stephen Lacey.

The position in many of the main streets of London and other large cities to-day is that pipes and cables for all purposes are laid side by side, or one over the other, criss-crossing at every road junction, and so close together that in many instances it is impossible to obtain working room round the plant of one undertaking owing to the proximity of other pipes and cables. There are many places in the inner area of London where it is necessary to use a garden trowel when excavating round a pipe because there is no room to use a shovel.

The following is a brief historical survey of the increasing use of the subsoil of highways for mains and cables that has led to the present state of congestion in London.

Prior to 1800, the only underground plant consisted of sewers, drains, and water pipes—and there were very few of these. In 1812, gas mains were laid in London streets for the first time, and by 1850, there were drains, sewers, water and gas mains in every street of importance. Underground telegraph cables were first laid about 1860, and the first cables for a public electricity supply about 1880. The laying of telephone cables started about 1895.

The present congestion underground in the older parts of London resulting from the gradual but continuous increase in the number of mains and cables, has been accentuated by the

fact that, in the initial stages of the development of both gas and electricity, powers to supply the more important districts were given to more than one undertaking. Also, although the areas of supply of the original water companies did not overlap, the trunk mains of the various companies empowered to take water from the River Thames were laid side by side along the main approach roads to the city. The supply of all three services—water, gas, and electricity—has now largely been rationalized, but some superfluous mains still occupy valuable space and are partly responsible for the exceptional state of underground congestion in many of the London streets.

An additional cause of congestion in main thoroughfares is the presence, in many instances, of electric tramways occupying a quarter to a third of the width of the carriageway. No new mains or cables can be laid within the area covered by the tram tracks, and access to mains or cables existing in this area prior to the construction of the tramways is rendered difficult, particularly if the tramways are constructed on the conduit system. Further, feeder cables for the supply of power to the tramway system have to be laid along the route in addition to the usual electric supply cables.

The close proximity of the various mains, cables, drains, &c., is objectionable, because it renders access to existing underground plant and the laying of new plant difficult and costly, and also because in such circumstances, every additional ground opening results in the disturbance of the foundations of existing plant which, in turn, leads to further trouble.

In many London streets it is impossible to find a route immediately under the road for the new telephone and electric cables now required, and it is therefore necessary to drive headings under existing plant. However carefully such a heading is driven and filled in, it is impossible to avoid risk of settlement at some later time, especially when the heading is only a few feet below the road surface and driven through "made up" or frequently excavated ground. The underground services which suffer most in this way are water and gas, partly because they have been long established and partly because water and gas mains are especially liable to damage by disturbance of the ground in which they are laid.

Subways.

Although the problem of how to lay mains and cables in such a way as to protect them from damage, render access to them easy, and reduce to a minimum the disturbance of the roads under which they are laid becomes increasingly important, the problem is not a new one, having in fact exercised the minds of highway engineers and of those responsible for the underground services for many years past.

The problem has always been intimately associated with that of traffic congestion. So long ago as 1860, or thereabouts, at a time when all vehicles in London were horse drawn, the traffic congestion was so serious that the newly constituted authority for London, the Metropolitan Board of Works, sought and obtained powers from Parliament to construct several new thoroughfares at great expense. At the same time, attention was directed to the disturbances of road surfaces for the purpose of laying and repairing water and gas mains, and there originated the proposal to construct pipe subways in the new roads.

In 1868, an Act of Parliament was passed authorizing the construction by the road authority of pipe subways under certain new thoroughfares and defining the relative rights and obligations of the road authority and the owners of the underground plant in relation thereto.

The granting of the powers to build pipe subways was opposed by the Gas and Water Companies on the ground that danger to life and property would result from the risk of leakages from the gas mains, and partly because it was proposed to charge a rental for the use of the subways based on their cost of construction. The first objection was overruled, but provision was made in the Act for ventilation and inspection of the subways. The second objection was met by basing the rentals on the cost of supervision of the subways. Subsequently, in 1893, the London County Council, the successors of the Metropolitan Board of Works, obtained powers to make charges for the use of subways and the supervision of such subways and the pipes and cables laid therein, according to a scale based upon such saving (if any) to the owner of the pipes and cables as may result by reason of the pipe being laid in the subway instead of being laid or remaining under the street. Under these Acts of 1868 and 1893, public utility undertakings were deprived of their rights to break up the roads in streets where subways were constructed, unless there should be insufficient space available in the subway.

There are now about 30 pipe subways under London streets with a total length of about 8 miles (12·9 kilometres), a length very short in relation to the many hundreds of miles of important thoroughfares. All have been built during the construction of new roads, and it is of interest to note that none of consequence has been built since 1905, when the important thoroughfares, Kingsway and Aldwych, were constructed in the course of an extensive improvement scheme.

In Great Britain during the last 12 months, special attention has been directed to the question whether or not the building of pipe subways, not only in new, but in existing streets, would go far to solve the problems with which the author is here concerned.

Those who advocate the building of many additional pipe subways are chiefly influenced by the fact that road openings for laying and repair of mains and cables have been very much reduced, if not eliminated, in the streets in which pipe subways exist, and that the fears of those who foresaw accidents arising from escapes of gas, &c., have not been realized. At the same time, they point to the many leakages from gas and water pipes laid in the subsoil of roads, such leakages being primarily due to the effect of ground movements.

On the other hand there are many, including those responsible for the distribution of gas and of electricity at high voltage, who do not place complete trust in the comparative immunity from serious accidents so far enjoyed, and who think it better to lay gas mains and high-tension cables in the ground. In taking this view, they have in mind instances where the fusing of cables in subways has resulted in damage to other plant, and to considerable escapes of gas which were fortunately remedied without accident.

The chief arguments from the standpoint of safety against the greatly extended building of subways to carry all mains and cables are:

(*a*) That while it is true that pipes in subways are protected from ground movements and from large temperature changes, and that consequently the risk of serious leakage from gas mains is small, nevertheless, it is not possible to eliminate altogether the risk of leakage on a scale much greater than the ventilation can be designed to deal with. Were the improbable to happen, the consequences might be disastrous.

(*b*) That as the risk of fusion of high-tension cables in subways cannot be altogether eliminated, such cables should be laid in the ground where the risk of serious damage in the event of a fusion is very greatly reduced.

The second important consideration with regard to pipe subways is that of cost.

It has already been stated that the pipe subways in London have all been built during the construction of new roads, and that the rentals charged for the use of the subways are based on the estimated saving to the owner of the pipes and cables resulting from laying in the subway instead of under roads. The author's experience with regard to the relative costs of laying and maintaining gas mains in subways and in the subsoil of roads is that the actual saving, if any, is small, and certainly insufficient to pay the annual charges on the capital expenditure on the subway.

It is unquestionable that the cost of building subways in existing streets where mains and cables have already been laid is many times greater than in new streets, because in addition to the cost of relaying in the subway all the mains and cables in the road, temporary accommodation has to be provided for the mains and cables that must be moved before the subway can be built. Moreover, the work almost inevitably involves the closing of the street for many months.

These considerations lead the author to the conclusion that the cost of building pipe subways in existing roads is, generally speaking, prohibitive, and that therefore a practical solution of the problem must be sought elsewhere.

Accommodation in New and Widened Roads.

The provision of ample width of footway is, the author considers, the most promising line for improvement in the accommodation of mains and cables in future roads. No undertaking would wish to lay their plant under expensive roadway paving if the work could be carried out at less cost in the grass verge, or in a lightly paved footway.

It must be recognized, however, that in main roads the footways and verges combined may well have to be of a width as great as, or greater than, the roadway; also that sewers must be laid under the carriageway if sufficient space is to be made available for pipes and cables in the footways. Pipes and cables cannot be laid safely close to a deep sewer trench, recently cut, and, moreover, when sewers are laid under footways, the drains connecting the roadway gullies with the sewers obstruct the laying of pipes and cables.

The primary object of widening works in city streets is the relief of traffic congestion, and therefore the carriageways are widened in preference to the footways. In such circumstances, it is seldom possible to provide footways of sufficient width to carry all the pipes and cables. There is, however, one improvement which could be made at relatively little cost, that is, the restriction of the height of vaults and basements to at least 4 ft. (1·2 metres) below pavement level, so that a reasonable depth of soil is provided between the footway level and the top of the vaults. Many footways in London streets cannot be used for the laying of mains or cables because the tops of the vaults or cellars are only a few inches below the flagstones. In some of the older streets, cellars project several feet into the carriageway.

Improved Methods of Laying Pipes and Cables.

The various suggestions, so far discussed, for minimizing the expense and inconvenience occasioned by breaking up

modern highways for the laying and maintenance of mains and cables, have been concerned chiefly with the position of the mains, &c., and their accessibility.

Account must also be taken of improvements with regard to the design and laying of the underground works, tending to reduce the cost of future maintenance.

The practice of laying cables in duct lines between boxes, which allows of new cables being drawn through in place of old ones without disturbance of paving, is a notable instance of improved methods. Modern cables are also provided with superior types of insulation and improved protection against mechancial damage, which should result in longer life and lower maintenance costs.

Leakage from, and breakage of, water and gas pipes may be reduced in future by the adoption of improved types of joints, and stronger materials for pipes. " Spun " cast-iron and steel pipes may come into more general use as more experience of them is gained.

Steel mains with welded joints possess obvious advantages, but many engineers are reluctant to adopt steel pipes for general use until the coatings used to protect them from corrosion have been proved to be reliable.

This is not the occasion to discuss in detail the technique of main laying, but enough has been said to indicate the desirability of seeking improved methods that may reduce the cost of maintenance in the years ahead.

The Economic Value of Coal Cleaning in Relation to the Problem of Dust and Sulphur Emission from Chimneys.

By Dr. R. Lessing.

It is the author's opinion that it is possible to remove the greater part of the ash and sulphur from coal before being fired, so that firing clean coal no longer offers the difficulties that otherwise obtain. Two examples are given showing the possibility of cleaning coal by the washing method, and the economy of the method is demonstrated in spite of the increased cost of the raw coal entailed by cleaning. This process reduces the transportation costs of coal and ash as well as the cost of pulverizing when firing powdered coal, for example, as this may be considerably influenced by the mineral admixtures normally present.

Economic Problems of High-Temperature Distillation

The General Report on this Section summarizes the trend of development as follows: Many problems in high-temperature gasification remain to be solved, although the engineer already has an indefinite feeling that we are approaching the end of a development of high-temperature gasification methods. A sure proof of this contention is the fact that the gas-production apparatus—*i.e.*, ovens and producers—have, neglecting differences in design, become very similar as regards principle and method of operation. Technical development shows that under such circumstances new ways must be found to ensure development.

Reviewing the present problems, we find that they are confined to the refining of methods, and the development of plant efficiency and reliability.

Let us follow the routine of high-temperature gasification.

The Coal is no longer chosen haphazard, but according to definite principles, which ensure a high gas yield and a good coke. It is the duty of the careful gas expert to ensure the highest possible homogeneity of the product used for gasification, by preparing the coal used in suitable machines (blending, grinding), because the use of a constant mixture is the most essential factor in realizing a higher efficiency. When using the same coal the working of the ovens is the same, the same quality of coke is produced, the gas can be refined in the same way, and, not least important, the quality of the gas remains constant.

The Running of the Plant.—The controversy concerning the use of oven or retort has long been settled. The solution lies in the quality of coke required. A better coke results when using large oven chambers.

The problem of the number of employees, and that of oven surface area, may be regarded as solved. The latest systems have probably reached the limit of possible development in this respect. It has been generally acknowledged that a suitable method for minimizing the content of inert constituents in the gas is the automatic control of pressure in the retorts.

The Refining and Purification of the Gas.—Here we find the liveliest activity. This is partly due to the desire to remove all undesirable constituents from the gas completely, and is partly necessitated by the falling price of bye-products.

It has been found most expedient to cool gases with the least amount of water possible, accompanied by the use of automatic regulation. The tests as to whether under-cooling is economical have not yet been concluded.

The removal of tar electrostatically is clearly making progress. Together with a higher yield of tar, this process facilitates the ammonia and benzole recovery.

The method used to recover the ammonia is wholly dependent on the improvements in the methods of removing sulphur. The old tested method of purification with ferric hydroxide is still used in the majority of cases, however the wet cleaning is beginning to be successfully adopted. Especially in the United States there is a steady increase in the application of this method. In Germany the processes of Koppers (" C.A.S. "), Prof. Fisher (ferrocyanide with electrolysis), and Rostin (at higher temperatures) are in the experimental stage.

In the extraction of benzole important economical success has been achieved. The economy of benzole extraction is often questioned. It depends on the price of benzole, the calorific value of the gas, and the price of steam.

The dry gasholder has been adopted for large-capacity storage.

New wet gas meters of high output have been brought on the market—*e.g.*, the Brandl-Marischka meters.

Producer plants are being improved continually. In Germany the mechanical central producer is replacing the static producer. Although the efficiency of the mechanical producer is no higher than that of the static producer, there are marked points in its favour—*e.g.*, the ovens are kept clean, the elimination of difficult manual labour, a constant calorific value of the gas used for heating. In addition, coke breeze can be advantageously used in these producers. The output of the producers relative to the surface of the grate has increased considerably.

Water gas plants are being continually improved or mechanized. In addition to the mechanical grate, mechanical devices for charging and control have come into use. The water gas plant has been transformed into a water gas machine, and the output of the units has increased. Tests concerning the conversion of inferior fuel into water gas are being carried out and hold out much promise. It seems that water gas is destined to become the chief source of heat in some countries.

The recovery of waste heat has been generally adopted, and has become a necessity. Complete gasification as well as low-temperature carbonization do not seem to progress.

The Bearing of Fluctuations in the Price of Coke and Bye-Products on the Cost of Production of Gas.

(Summary.)

(Joint Fuel Committee.)

By M. Barash.

Generally speaking, it pays to use the cheapest available coal which—

(*a*) can be carbonized satisfactorily in the plant,
(*b*) gives a satisfactory yield of gaseous therms, and
(*c*) produces residuals of a satisfactory nature, and particularly a coke with a reasonably low ash content.

After careful consideration and collaboration, it has been decided to adopt the following as representative mean yields of the main products per ton of coal carbonized in the gas industry, and the corresponding values as approximating most nearly to present-day average market prices.

Assumed Average Yields and Values of Products of Carbonization per Ton of Coal.

Gas Yield.—15,000 c.ft. at 500 B.Th.U. per c.ft. (*i.e.*, 75 therms).
Coke Yield.—13·5 cwt., or 67·5 p.ct. by weight, of which 10 cwt. (50 p.ct.) is available for sale (after allowing for fuel consumed in production of heat for carbonization, &c.).
Value.—25s. per ton.
Tar Yield.—12 gallons.
Value.—3d. per gallon.
Liquor Yield.—40 gallons of 8-oz. liquor, equivalent to 25 lb. of sulphate of ammonia.
Value.—Nil.

In addition to the above there may be made available about 2 gallons of crude benzole worth about 1s. per gallon, by scrubbing the gas; and some 1500 lbs. of steam (from and at 212° Fahr.) obtained from the " waste heat " from the setting, and worth about 20d. per 1000 lb.

No account will be taken of minor bye-products such as sulphur and cyanides, the recovery of which as an asset is questionable at present, and which in any case give comparatively

only so small a return that fluctuation in their values would have no material effect on the costs of gas production.

General Considerations.

A very useful and comprehensive analysis of the costs of gas production in several carbonizing systems and under various conditions was contributed by Dr. E. W. Smith to the Proceedings of the Second International Conference on Bituminous Coal held at Pittsburgh, U.S.A., in November, 1928.[1] The author's investigations have taken into account all the main factors influencing the cost of manufacture of the gaseous therm in continuous vertical retorts, intermittent vertical chambers, and horizontal retorts; and several important deductions may readily be drawn from his figures, particularly with regard to the influence of the value of the incidentals, coke and bye-products, as compared with costs of manufacture on the ultimate cost of the gaseous therm. As an indication of the extent to which these factors contribute in the balance, the following table is reproduced from Dr. Smith's paper.

Table 1.—*Comparative Costs of Gas Production (Dr. E. W. Smith, 1928).*

—	Continuous Vertical Retorts.		Intermittent Vertical Chambers.			Horizontal Retorts.
Calorific value B.Th.U. per c.ft.	510.	480.	540.	510.	480.	540.
Therms per ton	78	84	72	78	84	72
Fuel consumption p.ct.	14	15	14·5	16	17·5	15
Tar, gallons per ton	11	13	10	11	13	9·5
All Figures Pence per Therm.						
Coal cost	3·385	3·140	3·668	3·385	3·140	3·668
Capital charges	0·308	0·310	0·310	0·344	0·400	0·347
Labour	0·116	0·119	0·105	0·116	0·134	0·126
Fuel	0·475	0·467	0·532	0·540	0·550	0·550
Total	4·284	4·036	4·615	4·385	4·224	4·691
Less—Gross coke	2·421	2·182	2·622	2·421	2·182	2·622
Tar	0·705	0·774	0·684	0·705	0·774	0·660
Surplus steam	0·270	0·224	0·200	0·100	0·070	0·222
Net cost of gas per therm	0·888	0·856	1·109	1·159	1·198	1·187

In the above table, in each case the following items are assumed constant:

1. Coal cost: 22s. per ton.
2. Coke value: 22s. per ton.
3. Tar value: 5d. per gallon.
4. Capital charges and maintenance: 10 p.ct. per annum.
5. Working days: 250 per annum.
6. Value of surplus steam: 20d. per 1000 lbs.

Examination of the above figures leads to the following generalizations:

(*a*) The value of the total coke produced represents over 70 p.ct. of the cost of the coal carbonized.

(*b*) The credit for tar is sufficient to pay for the capital and maintenance charges, the labour costs, and a portion of the fuel cost.

(*c*) The value of "waste heat" as a factor in the production of cheap steam in connection with modern carbonizing plant is a definite, and not to be neglected, asset in the balance-sheet of gas production.

(*d*) The total value of the coke and bye-products forms so large a proportion of the credit side that the net cost of the gas is likely to be dependent to a much larger extent on fluctuations in the prices of these residuals than on variations in capital charges, fluctuations in labour costs, &c.

Coke.

The relative financial importance to the gas industry of the bye-products of carbonization as compared with coal costs, is indicated very clearly in the Table summarized by Rhead[2] from "Field's Analysis of Accounts of the Principal Gas Undertakings" for the years 1922 to 1925. The figures are the averages for about a dozen of the larger undertakings, and the period covered is chosen here as representing one in which no particularly marked development took place in carbonizing plant and methods, so that quantitative yields of the products per ton of coal remained approximately constant.

From Table 2 the figures in Table 3 are deducted, the calculations being based on the previous assumptions of the production per ton of coal of 15,000 c.ft. of gas at 500 B.Th.U. per c.ft. (75 therms) and the total of capital charges, fuel, and labour costs being taken as approximately constant for the period, and as the average of those given in Table 1—*i.e.*, 0·98d. per therm.

It will be observed from Tables 2 and 3 that a variation of 1s. in the selling price of coke per ton affects the cost of gas production to the extent of 3 to 4 p.ct.; as a fairly normal fluctuation is of the order of 5s. per ton, this one item would account for a variation of from 15 to 20 p.ct. in the cost of gas production. As the difference between the cost of production of gas and its selling price represents the revenue of the undertaking, it will be obvious that large fluctuations in the balance-sheet may readily ensue.

Table 2.—(*a*) *Quantity and Cost of Coal (Rhead)*

Year.	Coal Carbonized.	Approx. Cost per Ton.
	Tons.	s. d.
1922	2,148,000	27 5
1923	2,360,000	25 4
1924	2,348,000	25 3
1925	2,332,000	24 1

(b) Receipts for Bye-Products.

Year.	Coke per Ton.	Tar per Gallon.	Liquor (10-oz.) per Gallon.
	s. d.	d.	d.
1922	21 4	4·7	0·64
1923	23 6	5·6	0·54
1924	24 6	3·4	0·37
1925	18 11	3·3	0·34

(c) Receipts for Bye Products per Ton of Coal

Year.	Coke and Breeze.	Tar.	Liquor.	Total.
	s. d.	s. d.	s. d.	s. d.
1922	11 0	4 9	1 8	17 5
1923	12 0	5 8	1 5	19 1
1924	12 5	3 7	1 0	17 0
1925	9 6	3 5	0 11	13 10

(d) Receipts for Bye-Products as Percentage on Cost of Ton of Coal.

Year.	Coke and Breeze.	Tar.	Liquor.	Total.
	P.Ct.	P.Ct.	P.Ct.	P.Ct.
1922	40·0	17·3	6·1	63·4
1923	47·3	22·4	5·5	75·2
1924	49·1	14·0	4·0	67·1
1925	39·3	14·3	3·8	57·4

Table 3.—*Receipts for Bye Products per Therm of Gas Made.*

Year.	Coke and Breeze.	Tar.	Liquor.	Total.
1922	1·76	0·76	0·27	2·79
1923	1·92	0·91	0·23	3·06
1924	1·99	0·57	0·16	2·72
1925	1·52	0·55	0·15	2·22

All Figures Pence per Therm.

Year.	Gross Coal Cost. Per Therm.	*Plus* Capital, Fuel, and Labour Costs.	Net Cost of Gas Production.
1922	4·39	5·37	2·58
1923	4·05	5·03	1·97
1924	4·04	5·02	2·30
1925	3·85	4·83	2·61

Note.—For "per 1000 c.ft." basis multiply above figures by 5.

This influence of the coke value is brought out even more strikingly in Table 4, reproduced from the paper of Dr. E. W. Smith referred to previously, where a lower value than the above is assumed for the coal, and the value of the coke is varied over a fairly wide range.

Table 4.—*Comparative Costs of Gas Production (Continuous Vertical Retorts) (Dr. E. W. Smith).*

Variation in Cost of Coke.

—	All Figures Pence per Therm.		
	A0.	A.	A1.
Coal cost	3·430	3·430	3·430
Capital	0·293	0·293	0·293
Labour	0·110	0·110	0·110
Fuel	0·323	0·445	0·567
Total	4·156	4·278	4·400
Less gross coke	1·782	2·451	3·120
Tar	0·713	0·713	0·713
Surplus steam	0·257	0·257	0·257
Final net cost per therm.	*1·404*	*0·857*	*0·310*
Coal per ton	22s.	22s.	22s.
Coke per ton	16s.	22s.	28s.

[1] "A Study of Comparative Costs of Gas Production in the Retort House." Dr. E. W. Smith, "Gas Journal," Dec. 26, 1928.

[2] "Coal Gas Bye-Products and Their Utilisation." T. F. E. Rhead, Britain's Fuel Problems, London, The "Fuel Economist," 1927, pp. 343-353.

In the foregoing table the same assumptions are made as given under Table 1, but the fuel consumption remains constant in all three cases (at 13 p.ct. of the weight of coal carbonized), while the coke is regarded as being worth 16s., 22s., and 28s. respectively.

Incidentally, another important point brought out in this table is the importance of the fuel consumption figure, particularly when coke fetches a good price.

The position with regard to coke disposal in the British gas industry was indicated recently by Sir David Milne-Watson in his Presidential Address to the Institute of Fuel,[3] October, 1929. He stated that, in general, the manufacture of coal gas results in the production of coke in excess of the demand, and the gas industry has had, therefore, to regulate the supply of coke to the home market by export and by the conversion of part of the remainder into carburetted water gas.

> "Last year (1928), of the 17,000 c.ft. of gas produced by authorized (British) gas undertakings from each ton of coal carbonized, only 14,200 c.ft. was coal gas. In addition to the coal gas so produced, 13·4 cwt. of coke (67·0 p.ct.) was manufactured, and of this 3·6 cwt. was used for firing retorts and for other works uses; 1·1 cwt. absorbed in the manufacture of water gas; and 1·1 cwt. exported; leaving 7·6 cwt. of coke for home disposal. In other words, a home sale of 0·45 cwt. of coke was effected for each 1000 c.ft. of gas sold."

Another important factor referred to by Sir David is that the balance of receipts for bye-products far outweighs any economies that can be effected by the use of large units. In other words, the cheapest gas is not necessarily made by the biggest undertakings. Highly efficient plants are available for small undertakings, so designed and operated as to give low costs of production. A good example of this was given in a recent paper by Mr. J. E. Blundell,[4] wherein it is shown that in an installation of continuous vertical retorts on a works making only some 60 million c.ft. annually, after nearly four years' operation, the cost of production of gas per therm was as low as 1·41d., the price of coal being 19s. 2½d. per ton and the selling price of the coke 20s. 6d. per ton. Though no account is taken here of capital charges, the figure compares very favourably with those given for much larger installations.

Thus, in contradistinction to the principle prevailing in the generation of electricity, the size of the individual gas-works is not so much a factor in cheap production as a favourable ratio between the price of coal and the return for residuals, brought about, for example, by a works favourably situated in regard to the transport of the necessary coal, accompanied by a good demand for coke in the neighbourhood.

Steaming and Water Gas Production.

As was pointed out recently by Alderman F. J. West,[5] "so rapid has been the increase of efficiency during the last twenty years in this country (Great Britain) that, whereas the total annual production of gas increased from 188,487 million c.ft. in 1907 to 297,697, million in 1927—an increase of 57½ p.ct.—the quantity of coal used in the satisfaction of this enormously increased demand only increased from 15·4 million tons to 17·7 million tons—an increase of only 16½ p.ct." There is little doubt that to an appreciable extent this increased efficiency is attributable to the introduction of the process of "steaming" the charge during carbonization, particularly in continuous vertical retorts, which account at present for about 50 p.ct. of the gas manufactured in the gas industry. The economic aspects of this steaming process are well worth consideration from the point of view of the relative values of coke and the gaseous therm. The following figures represent the results actually obtained on an industrial full-sized carbonizing unit when using a medium class Lancashire gas coal of approximately the composition:

> Moisture, 2·5 p.ct.; ash, 7·5 p.ct.; volatile organic matter, 33 p.ct.; and fixed carbon, 57 p.ct.

It will be observed that the actual gas yields obtained correspond very closely with the calculated theoretical yields.

Comparatively little deterioration takes place in the coke produced even in the latter tests. The ash content in the large coke (above 1 in.) increases from 8·5 p.ct. with little steaming to 17·6 p.ct. in test *G*; the breeze (below ½ in.), calculated as a percentage of the total coke produced, increases from 8 p.ct. in test *A* to 22 p.ct. in test *G*, while the ash content in this breeze increases from 12·6 p.ct. to 34·4 p.ct. respectively. It would appear that the steam reacts mainly with the carbon on the outer surfaces of each piece of coke, tending to reduce the average size of the coke pieces, and resulting in the production of breeze of inferior quality, but not having a very marked deleterious effect on the large coke.

The coke produced from each of the tests in the series, even that obtained in the test at 350 B.Th.U., was a clean, dry, free-burning fuel which ignited freely and was consumed readily in domestic grates as well as in the producer supplying heat to the carbonizing system.

Incidentally, the tar produced increases from 11·3 gallons (dry) in test *A* to 25·3 gallons in test *G*; and the yield of sulphate of ammonia recovered increases from 12·8 lbs. to 21·3 lbs. per ton of this coal. (In this installation a considerable proportion of the ammonia is passed on with the gas to the purifiers.)

It will be realized that such a high degree of flexibility is invaluable in allowing of the attainment in the modern standard carbonizing plant of a large variation in the quality of the gas. But as deserving of even more consideration is the fact that there is available a method of adjusting quantitative yields of gas and coke in the one plant to the varying requirements of the market.

Table 5.—*Yields of Gas by Progressive Steaming of Coal.*

[Yields per Ton of Coal.]

Results Calculated from Assumed Make of 13,000 C.Ft. at 550 B.Th.U. (without Steaming), and the Addition of 1000 C.Ft. of Water Gas at 300 B.Th.U. for each 15·6 lb. of Carbon Converted.			Results Obtained on Industrial Scale Test Plant—One Retort of Nominal Capacity 5 Tons per 24 Hours.			
C.Ft.	Cal. Value B.Th.U. per C.Ft.	= Therms per Ton.	Test.	C.Ft.	Cal. Value B.Th.U.	= Therms per Ton.
13,000	550	71·5	..	..	..	..
16,200	500	81·0	A	16,970	503	85·3
18,600	475	88·4	B	19,120	472	91·2
21,700	450	97·6	C	22,600	445	100·6
26,000	425	110·5	D	27,400	423	115·8
32,500	400	130·0	E	30,350	401	121·7
43,300	375	162·4	F	43,370	373	161·8
54,200	360	195·1	G	53,200	360	191·4
65,000	350	227·5	H	70,000	350	245·0
97,000*	334	323·5	..	..	..	..

* Complete gasification of coal.

Tar.

The present income from crude tar at the works can only be taken at approximately half of the value indicated in Table 1, and this would make a difference in the net cost of production of gas per therm of approximately 0·35d.—a surprisingly large percentage on the total cost of production.

Benzole.

The amount obtainable from the gas is from 1½ to 2½ gallons per ton of coal, and in exceptional circumstances 3 gallons may be recovered. The maximum value realizable, therefore, when sold as motor fuel would be about 3s. If allowed to remain in the gas, this benzole (at 156,000 B.Th.U. per gallon) would be equivalent to 3·1 therms, and assuming that gas is being sold at 9d. per therm, the revenue from the benzole vapour would be about 2s. 4d. (28d.). Taking into consideration the cost of debenzolizing plant and the working costs of the process as against the enriching effect which this benzole has on the cheap water gas present in the mixed coal gas, as well as other advantages of allowing it to remain in the gas, it is evident that the recovery of benzole is not a paying proposition in the gas industry.

Disposal of Effluent Liquors.
(Joint Fuel Committee.)

By Allan C. Monkhouse.

Evaporation.

The evaporation of the whole effluent is not a practical proposition, unless sufficient waste heat is available for this purpose.

The devil liquor or the aqueous condensates after the saturator can be evaporated effectively by spraying into the base of a retort house chimney, on the bars of producer grates, or in hot flues. The evaporation of this liquor usually reduces the volume of the effluent by 10-15 p.ct. and reduces the oxygen absorption of the liquor by 20 p.ct. in cases where the indirect or semi-direct method of recovery is adopted.

Effluent liquors have been used for coke quenching. This method is applicable to those systems such as coke ovens and horizontal retorts in which red-hot coke is discharged. The disadvantages are the discoloration of the coke and the fumes evolved, which latter render the method unsuitable in those cases where quenching is carried out in enclosed spaces. Care must also be exercised with the drainage water.

A partial evaporation to remove phenol has been adopted by Dr. T. L. Bailey in a number of large-scale experiments. Steam and hot flue gases are passed through the spent liquor maintained above 90° C. in towers, and the phenols are volatilized into the air. At one plant where 3 tons of sulphate of

---

[3] "Gas Journal," Vol. 188, pp. 305-308.

[4] "Vertical Retorts for Small Works." By J. E. Blundell, "Gas Journal," Vol. 187, pp. 678-680.

[5] "The Gas Industry at Home and Abroad." By F. J. West, "Gas Journal," Vol. 188, pp. 320-322.

ammonia were made per day over 70 p.ct. of the phenols were volatilized, and at another plant 90 p.ct. The process was costly in steam, amounting to approximately 36 p.ct. of the effluent treated, and only reduced the monohydric content of the liquor. By carrying out the evaporation in a trough in a hot flue the consumption of steam can be reduced.

Purification in Admixture with Sewage.

One of the most general methods for the disposal of effluent liquors is their admission to the sewers and their treatment by the normal methods of sewage purification. The proportion of spent liquor from gas-works in districts in England where the gas-works and sewage works serve the same area is about 0·5 p.ct. of the average dry weather flow of sewage. Satisfactory results can be attained by avoiding sudden changes in the proportion of spent liquor admitted; in cases where sulphate of ammonia is made intermittently, balancing tanks for the spent liquor should be installed for this purpose. Cooling of the spent liquor and efficient settlement are also necessary. The following detailed observations have been reported of the regulated admission of spent liquor from vertical retorts to a domestic sewage free from industrial wastes.

Dry weather flow of sewage	1,750,000 gallons per day
Flow of effluent liquor	8,400 ,, ,,

The method of sewage purification is sedimentation tanks followed by percolating filters. The flow of sewage to the filters is about 110 gallons per cubic yard per day. Sulphate of ammonia is recovered at the gas-works by the indirect process, and only the "free" ammonia is recovered from the liquor.

An average sample of the effluent liquor gave the following composition:

—	Parts per 100.000.
Phenols	307·1
Thiocyanate as CNS	444·0
Thiosulphate as S	56·3
Oxygen absorbed (4 hrs. 27° C.)	1369

The following table summarizes the results obtained:

—	Parts per 100.000.					
	Crude Sewage.		Settling Tank Effluent.		Final Effluent.	
	No Spent Liquor Present.	0·5 P.Ct. Spent Liquor Present	No Spent Liquor Present.	0·5 P.Ct. Spent Liquor Present.	No Spent Liquor Present.	0·5 P.Ct. Spent Liquor Present.
Suspended solids	16·00	19·00	2·60	3·60	2·16	1·86
Free and saline ammonia	4·34	6·85	4·74	6·88	0·32	1·73
Albuminoid ammonia	0·62	0·90	0·48	0·61	0·07	0·13
Chlorine as chlorides	9·33	14·60	9·59	14·48	9·36	13·02
Oxidized nitrogen	*Nil*	*Nil*	*Nil*	*Nil*	2·14	2·42
Oxygen absorbed (4 hrs. 27° C.)	5·47	13·49	3·76	10·55	1·14	1·60

It was clearly shown over extended working that this proportion of spent liquor can be satisfactorily purified in admixture with sewage without detriment to the bacteria beds, giving a final effluent which was non-purifactive. There was also evidence that the additional work of purification which resulted from the admixture of 0·5 p.ct. spent gas liquor was not so great as would be calculated from the increase in the oxygen absorption of the sewage by the addition of the liquor.

In the case of coke ovens, the proportion previously stated between effluent liquor and domestic sewage does not apply, and in extreme cases such as the Ruhr district of Germany, where the coke ovens are concentrated in one district, the problem of disposal at the sewage purification works becomes more difficult, necessitating increased purifying area. By providing a large area and a diminished flow of sewage, purification has been effected of spent liquor up to 9 p.ct. of the flow of sewage, or by use of the Emscher filter spent liquor and sewage have been purified in the proportions of three to five.

Where activated sludge methods of sewage purification are adopted greater care must be exercised in obtaining a regular flow of spent liquor proportional to the sewage flow.

Biological Purification without Admixture with Sewage.

This method consists of the addition of diluted effluent liquor to matured bacteria beds. The beds are matured by means of domestic sewage or dung, and increasing proportions of spent liquor are added until finally the domestic sewage is replaced by purified effluent. This process has been studied in detail by Fowler, Ardern, and Lockett, and large-scale plants have been operated at the gas-works at Bradford and Coventry. The spent liquor at Bradford is diluted with 20 parts of purified effluent and at Coventry with 23 parts of purified effluent. The results obtained at the two works may be briefly summarized:

—	Bradford.	Coventry.
Volume of effluent treated per day, gallons.	30,000	40,000
Dilution	1 : 20	1 : 23
Oxygen absorption of spent liquor (4 hrs. 27° C.), parts per 100,000	700	900
Efficiency of purification, p.ct.	80	89
Rate of flow-diluted liquor, gallons per cub. yard per day	80	122
Rate of spent liquor, gallons per cub. yard per day	4	5·3

At Coventry four percolating filter beds 120 ft. in diameter covering an area of one acre are used. These are filled with graded granite from ¾ in. to 1½ in. size. The effluent spent liquor treated per day is 40,000 gallons. The running costs are equivalent to 10s. 9d. per ton of sulphate made, or taking into account interest and depreciation on capital, 30s. 7d. per ton of sulphate. These figures represent 2·5d. and 7·3d. respectively per 100 gallons of spent liquor treated.

Dr. Bach, in an attempt to reduce the initial costs, devised for this purpose the "Emscher" filter. The plant consists of a tank filled with hard slag, through which diluted spent liquor flows; at the same time air is blown through the liquid. The filter is first matured with domestic sewage, and finally the spent liquor is diluted with three parts of purified effluent and a small flow of domestic sewage. The optimum temperature is 26°-28° C. The cost of treatment is 1·6d. to 2·7d. per 100 gallons.

An experimental plant has been erected at the Helene Coke Ovens, near Essen, where purification efficiencies of 95 p.ct. have been attained. The volume of media required is approximately one-fifteenth of that required by the percolating filter method, but an increased cost is incurred due to the aeration necessary.

The two processes described involve high initial outlay, high running costs and difficulty of working due to the sterile nature of the effluent liquors. The processes compare unfavourably with the method of purification in admixture with sewage where such method is available.

Economic Recovery of the Constituents of the Liquors.

The methods described in the three preceding sections are destructive methods. Considerable attention has been paid, particularly in recent years, to the question of recovering products from the effluent liquors which would be of marketable value, thus reducing or completely recovering the costs of disposal or purification.

The following products have received attention: Phenols, thiocyanate, catechol, and pyridine. Only the recovery of the first product has been developed on a large scale.

Phenols.—The monohydric phenols, consisting mainly of carbolic acid and cresols, may be recovered by means of solvents, by volatilization, or by active carbon. It is preferable to carry out the process with crude ammonia liquor before ammonia recovery, due to the difficulties experienced with the calcium salts present in the effluent liquors, and the greater dilution.

The general principles of the methods adopted for the recovery of phenol by solvents are:

(1) A preliminary washing or filtration of the ammonia liquor to remove tarry particles.

(2) The washing of the liquor, preferably at 50°-60° C., with (*a*) benzole or (*b*) tar oils in a suitable washer, static or rotary, for the recovery of the phenols.

(3) The recovery of the phenols from the washing liquid (*a*) as crude phenols by distillation or (*b*) as sodium phenolate solution by washing with soda solution.

Large-scale plants using benzole as the solvent are in operation in Germany and America for the recovery of phenols from ammonia liquors from coke ovens. The efficiency or recovery is 70-90 p.ct. according to the proportion of solvent used and efficiency of washing.

At the present time in Germany the recovery of phenols by this means can be considered as a profitable undertaking. Of the two processes cited for the recovery of the phenols, the distillation method involves less plant area, lower carriage costs for the crude phenols, the direct recovery of the phenols, and waste heat available for preheating the liquor. The soda method requires no steam for distillation, allows of the use of a larger volume of solvent with increased efficiency and less loss of solvent in the finished product. Comparative costs appear to indicate that the soda method is the cheaper one.

Other solvents such as tar oil have been used, but, although they have advantages in cheaper cost, lower solubility, and volatility, it has been stated that they have a greater tendency to emulsification.

The solvent method of recovery has not yet been applied to gas-works owing to their smaller size generally, to their different methods of carbonization, and to there being no easy

means of benzole recovery, since the indirect process of ammonia recovery is operated.

A process has been evolved by the Koppers Company in America in which the hot ammonia liquor from the bottom of the " free " still is pumped to the top of a dephenolating tower packed with spiral rings. The liquor at a temperature of 100° C. meets a current of steam and gas, the phenol is volatilized and the circulating gas washed with caustic soda solution in the lower sections of the tower. The dephenolated liquor flows back to the " fixed " still, and the sodium phenolate solution is used in the benzole plant, where the crude phenols are recovered.

The efficiency of removal of the phenols is 95 p.ct., 92 p.ct. being removed in the dephenolizer and the remainder in the free still. The process involves a higher capital cost than the benzole process, and a constant circulation of hot gases.

The use of active carbon for the removal of phenol has been investigated in England by D. W. Parkes, of Robinson & Co., and in Germany by the Carbo Union. The work has not yet been carried out on a large-scale plant, but laboratory and semi-large scale working are said to give promising results. In Parkes' process the effluent is treated with carbon dioxide or other reagent until acid to litmus, and after settlement passed through a series of absorbers containing active carbon. The phenols are subsequently recovered from the carbon by steam distillation. In the Carbo Union's process, the ammonia liquor is passed over active carbon and the phenol recovered from the carbon by means of benzole. A large-scale plant of this type is being erected in the Ruhr.

Thiocyanate.—The recovery of thiocyanate has been attempted for gas-works effluent liquors, but the process is both expensive and troublesome to work. The general principle is a preliminary removal of calcium salts as carbonate, slight acidification of the liquor, and the precipitation of the thiocyanate as the cuprous salt. The cuprous thiocyanate is then converted to an alkaline thiocyanate and the copper salt, after regeneration, returned to the system. This system and various modifications have been worked out by Crowther, Lewis, and Radcliffe.

Catechol.—Some preliminary experiments have been made by D. W. Parkes on the recovery of catechol from ammonia liquors. This compound exists in liquors from low-temperature carbonization or from vertical retorts, but is only present in small amounts in horizontal retorts or coke oven liquors. The method adopted is a pretreatment to remove organic matter, sulphide and carbonates, acidification to a p_H value of about 5-6, and precipitation of the catechol as the lead salt using lead chloride in sodium acetate solution. The lead pyrocatechol is filtered off, decomposed with acid, and the crude catechol refined. The liquors treated contained 0·2 to 0·25 p.ct. of catechol. The process has been worked on a semi-large scale.

Pyridine.—In the solvent method of phenol recovery, some pyridine is removed from the liquor by the solvent, but its recovery by acid washing is not considered to be an economic proposition.

Economics of Benzole Extraction in the Gas Industry.

(Joint Fuel Committee.)

By HAROLD HOLLINGS.

In a general consideration of the economics of extraction it is convenient to consider first the value to be assigned to the benzole in its existing gaseous form by reason of its contribution to the heating value of the gas. While in the coke oven industry it has become standard practice to extract benzole from the gas, which for industrial purposes commands a relatively low price, and to divert it in liquid form into a more remunerative market, the absence of any such uniformity of practice in the gas industry suggests at least that the question requires closer consideration. In coal gas which has been purified to the degree necessary for distribution for town purposes in England, and which is already at a point whence it can be distributed readily to an urban community, the benzole is of higher value than in gas for which there is only an industrial market.

In the following discussion it is assumed that when a benzole extraction plant is installed arrangements will be made to cease temporarily the removal of benzole at the time of the winter peak load, in order that the gas available for general distribution may be so increased. In this connection it may be pointed out that the adoption of benzole extraction by an undertaking making coal gas only represents an increase in business which, expressed upon a thermal basis, is equivalent to an increase in gas sales of about 6 p.ct. In the case of an undertaking making a mixture of coal gas and water gas, the increase is slightly less. This increased business continues uniformly day and night and may be terminated at the convenience of the undertaking without regard to any statutory obligation to a gas consumer. Also, except to the extent noted below, the business is secured without expenditure upon gasholders and mains.

The programme of a gas undertaking may be modified in one of several ways in order to meet the circumstances created when benzole is removed from the gas. In certain circumstances, and particularly if coal gas only is made, there may be a reduction in the calorific value of the gas distributed. On the other hand, the method of carbonization may be modified so as to produce a richer gas which after benzole extraction will have the same calorific value as the gas previously made. Alternatively, if water gas plant is available there may be an increase in the ratio of coal gas to water gas in the mixture supplied, or the benzole removed from the coal gas may be replaced by cracking more gas oil in the water gas plant.

SUPPLY OF GAS OF LOWER CALORIFIC VALUE.

If it is decided to reduce the calorific value of the gas supply, then the value to be assigned to the benzole prior to its removal will be made up of three components.

a. The net cost of coal gas manufacture expressed upon a thermal basis should be ascertained from the works records. This cost should be inclusive of all charges incurred up to the holder inlet except that the capital charges of the gas manufacturing plant should be excluded when arrangements are made to cease benzole extraction at the time of the maximum demand for gas.

b. Allowance must be made for the fact that the cost of storage of the gas will be increased proportionately to the reduction in the calorific value of the gas.

c. Allowance must be made for the fact that larger gas mains may be required for the distribution of a given amount of energy in the form of gas of lower calorific value. A calculation of this allowance under any particular set of conditions will be modified by the consideration that the specific gravity of the gas is reduced by the elimination of the benzole. For example, when extracting all the benzole from coal gas the specific gravity may be reduced from 0·43 to 0·40.

The conversion of all these charges from the thermal basis to the basis of a unit of crude benzole is considered later.

PRODUCTION OF RICHER GAS PRIOR TO EXTRACTION.

It would appear that the vertical retort plant to which steam is normally admitted during carbonization should lend itself particularly to alterations in the calorific value of gas produced designed to permit of the extraction of benzole without alteration in the calorific value of gas distributed to the consumer. For example, an undertaking may be supplying gas with a calorific value of 475 B.Th.U. to its consumers, and such gas may be made entirely in vertical retorts to which steam is added. If the whole of the benzole is extracted from such gas the calorific value would be decreased to about 450 B.Th.U. per c.ft. Such a reduction may be prevented by a reduction in the amount of steam admitted to the retorts when the extraction of benzole is commenced so that the calorific value of gas made in the retorts is raised to about 500 B.Th.U. This will have the effect of reducing the gas-making capacity of the retorts, but this in itself cannot be regarded as a disadvantage provided that arrangements are made to discontinue the extraction of benzole and increase the output of gas from the retort house at the time of the maximum demand for gas.

The value to be assigned to the benzole prior to its removal in these circumstances will be arrived at only after a careful determination of the net cost of gas manufacture, exclusive of capital charges, under the different conditions of steam admission, coal input, and gas output of the vertical retort plant.

VARIATION IN THE RATIO OF COAL GAS TO WATER GAS.

If it is decided to vary this ratio without making any reduction in the calorific value of the gas, then the value to be assigned to the benzole in the gas is independent of the factors considered under *b* and *c* above except that perhaps there may be some slight change in the specific gravity of the gas. The value will be mainly dependent upon the relative net costs of coal gas and water gas exclusive of capital charges. The increased quantity of coke available for sale may or may not be regarded as advantageous.

REPLACEMENT OF BENZOLE BY CRACKING GAS OIL.

The cost of replacement in this way may be considered on the assumption that the volumetric proportions of coal gas and of carburetted water gas will not be materially modified, but that the decreased calorific value of the one will be balanced by an increased calorific value of the other.

The cost of replacement of benzole in this way depends not only upon the cost per gallon of the oil used for carburetting, but also upon the efficiency of the carburetting process. This efficiency depends upon the amount of carburetting which is necessary. Thus when the calorific value of the original coal gas is not below 550 B.Th.U. per c.ft., and when the proportion of water gas in the mixture with coal gas is not greater than 25 p.ct. by volume it is possible to remove the whole of the benzole from the coal gas and at the same time maintain the calorific value of the mixture at 500 B.Th.U. by the use of not more than 1·5 gallons of oil per 1000 c.ft. of carburetted water gas. Under these conditions, it may be assumed that the yield of gas from each gallon of oil is 1·2 therms. When, however, the calorific value of the original coal gas is less than 550

B.Th.U. per c.ft., or when the proportion of water gas is more than 25 p.ct., or when the desired calorific value of the mixture is higher than 500 B.Th.U. per c.ft., it is necessary to use more oil per unit volume of water gas, and a corresponding lower yield of gas per gallon of oil may be anticipated because of the practical difficulty of cracking efficiently a larger quantity of oil.

Another example may be considered. Supposing that 80 p.ct. of stripped vertical retort gas with a calorific value of 480 B.Th.U. per c.ft. is mixed with 20 p.ct. of carburetted water gas, the calorific value of the latter must be 580 B.Th.U. to give a mixture of 500 B.Th.U. per c.ft. This would involve the use of at least 2·9 gallons of oil per 1000 c.ft., and the gas yield would not exceed 0·9 therm per gallon of oil. Using unstripped gas it may be assumed that 1·7 gallons of oil would be required, and that the gas yield would be 1·2 therms per gallon. Thus the gas yield from the extra 1·2 gallons used for benzole replacement may be only 0·5 therm per gallon instead of 1·2 therms per gallon as in the previous example. It is believed that when using larger quantities of oil the gas yield could be improved by the adoption of oil preheaters which were not available in the plant to which these examples refer.

In the first example quoted, which is representative of a works having horizontal retorts, benzole equivalent to one therm is replaced in the gas by the cracking of 0·83 gallon of gas oil, whereas in the second example, representative of a works having vertical retorts, 2·00 gallons of oil are required to replace the same quantity of benzole.

The relative inefficiency of the oil cracking when using larger quantities of oil results in a higher yield of carburetted water gas tar. Thus the market value of this tar must be considered in arriving at the net cost of the oil under any given set of circumstances.

From the examples quoted above it is clear that in certain circumstances the economics of benzole recovery are intimately bound up with the cost of gas oil used for carburetting, the value of the tar obtained as a bye-product, and the technical efficiency of the carburetting process.

It may be concluded also that when the calorific value of gas to be delivered to consumers is relatively high, or when for any other reason there is any special difficulty in increasing the calorific value of the gas normally made, the cost of thermal replacement is likely to be higher in the case of gas made in vertical retorts to which steam has been admitted than in the case of gas of higher calorific value made in horizontal retorts or ovens. This, however, is by no means a general disability of the process involving the admission of steam to the retorts for, as shown above, there are circumstances in which the proportion of steam admitted may be advantageously reduced when benzole extraction is introduced.

Solid Fuels: Production, Trade, and Treatment

Sale of Coal under Specification.

By R. A. Burrows and N. Simpkin.

The general lines of selling coal to contractors' specification are explained. The collieries should no longer oppose the desire of the purchaser to buy coal according to a quality specification, so that the price of the coal corresponds with the quality. The costs of sampling and analysis are small in comparison with the advantages of a sliding selling scale. The chief points of a contract are agreement as to sampling and tests. In addition to the calorific value, moisture and ash have to be considered in the evaluation, and according to the special purpose required, consideration must also be given to the caking properties, sulphur content, the volatile constituents, together with the melting point of the ash. Definite standardization of the commercial kinds and sizes of coal constitutes the foundation, and international agreement is advocated on this point and on the methods of sampling and testing coal.

Purchase and Sale of Coke to Specification.

By E. C. Evans.

Particulars are given of contractors' specifications for the sale and purchase of blast-furnace coke, which were agreed upon between the collieries and the iron industry in one part of England in 1924. The coke was valued according to the content of combustible matter, and a standard coke was one containing 19·99 p.ct. ash plus moisture; premiums or penalties were allowed for each unit percentage above or below. The principal disadvantage in this standardization was the disregard of the physical qualities. Three committees on coke research are investigating further the question of its valuation and a method of determining the " shatter test index " was worked out.

Economic and Commercial Development of Low-Temperature Carbonization in Great Britain.

By Dr. C. H. Lander.

As distinct from the gas and coke industry, low-temperature carbonization has no predominating product of its own, but only such as are dependent as regards price upon variable market conditions. On that account the economics of low-temperature carbonizing plants do not rest on any secure basis. The demand in England for smokeless fuel is, however, an incentive to the erection of low-temperature carbonizing plants, while the low-temperature tar is worthless from the economic standpoint so long as cheap refining processes are lacking. Moreover, the demand for semi-coke lumps for house fuel and for small industries is too small for a low-temperature carbonizing industry on a large scale.

The profitable character of low-temperature carbonizing plants with coke as the main product can only be partially assured if the gas generated can also be disposed of at a profit. The development of the British low-temperature carbonization industry is consequently dependent upon the creation of a market for semi-coke encouraged by official regulations for the amelioration of the smoke nuisance.

The best economic solution seems to be that of connecting low-temperature carbonization plants with gas-works, where the distribution of coke and sale of gas provide favourable conditions for development. The linking of low-temperature carbonization plants and power stations has not made any great progress, as yet, in England.

While refraining from detailed calculations of economic efficiency, for which no basis at present exists, the various low-temperature carbonizing processes are critically discussed, and such of the processes as have attained to large-scale operation are described from the technical standpoint.

Education

On this section of the Conference, the General Report, discussing trends of development, states that plants for the production and distribution of energy have developed to an unprecedented degree during recent years both from the technical and economic point of view. On this account the technical requirements made of the personnel have greatly increased as compared with former times, and problems connected with the suitable technical training of employees and responsible officers have become particularly prominent. It has not been easy to find solutions to these problems in view of the diversity of the methods of manufacturing and supplying energy. That different methods have been adopted in the various industrial countries to find solutions is to be explained by the different local conditions obtaining and by the different conceptions held concerning the technical training of recruits to industry.

Essentially two opposing views are held. One postulates that the technical college, whatever the kind, should provide the engineering student with a general fundamental training in technical principles, that further instruction in special branches of engineering should be left until afterwards during the period in which the engineer is engaged in his profession, and that the necessary knowledge should be acquired by self-instruction The other opinion considers that the student should preferably concentrate on specialization from the beginning.

In addition to technical training in a constructive and economic sense, great importance attaches nowadays to the study of " human economics " in view of the increasing mechanization of industry and the tendency to rationalization.

Generally speaking, it is recognized that successful technical training is impossible unless the student obtains a knowledge of engineering materials and processes by actually working in the shop. Various views obtain as to the period of time which should be devoted to practical work and when that work should be carried out. Some consider that it should commence, at any rate to some extent, prior to theoretical training, while others consider it more expedient to carry out practical training hand in hand with theoretical instruction on the " sandwich " system.

Excellent results have been obtained in many instances by giving theoretical training during the time in which the young

engineer or employee is actually engaged in his calling; these take the form of evening classes and correspondence courses, in which the large industrial works and engineering associations provide for the technical education of young employees in their own works schools or by themselves paying a large proportion of the fee charged for attending local classes.

That sound technical training may be obtained in various ways is admitted, the only question being which is the quickest and best. This can only be satisfactorily answered by an international exchange of experiences and international collaboration. With the increasing ramifications of power economics in the different countries the establishment of fundamental rules for the training of young engineers and technicians would appear to be an urgent necessity. It not only affects the development and improvement of power production but also the community at large, which is economically interested in such development either as a producer or a consumer of energy.

The Training of Gas Technicians.

(Institution of Gas Engineers.)

By Sir Francis Goodenough, C.B.E.

Having outlined the Education Scheme of the Institution of Gas Engineers, Sir Francis observed that when the Scheme was initiated some difficulty was experienced in securing its adoption throughout the whole country, because many of the gas-works are small and are at some distance from a suitable school. This difficulty has, however, largely disappeared as the Institution has committed the task of looking after the interests of students to its District Committees, each of them assisted by an Inspector of the Board of Education as a liaison officer between the District Committee and the schools. It is the business of the District Committee to ascertain the whereabouts and requirements of every potential student in its area and to see that his attention is directed to the importance of adding to his works experience at a recognized educational institution for tuition in at least the necessary ancillary subjects if not in the main gas subject. The Inspector of the Board of Education advises the District Committee as to the institution which can most conveniently be reached by the student and in some cases actually sees the student and discusses with him his plans for attendance. In spite of the widespread nature of the industry it is rarely found impossible in one way or another to see that no diligent worker lacks facilities for receiving instruction. This is not always given in a Technical School, but is occasionally provided in a Secondary School, with the consent of its Governors. Where, however, it is impracticable for a student to obtain such tuition, arrangements are made for the examination of the student in the ancillary subjects. Where he has had tuition in a recognized institution the certificate of that institution is accepted in respect of his knowledge of the ancillary subjects.

Another difficulty has been, and still to an extent is, that of securing an adequate supply of teachers—*i.e.*, of technicians qualified to teach. The supply is still scarcely adequate, but a good deal has been done to assist in the supply by holding once a year during the last four or five years special classes in the art of teaching for actual or potential teachers. No difficulty has been experienced in finding people of eminence in the profession of gas engineering who were willing to give all the help in their power in these courses of instruction for teachers.

The scheme has not been in operation for many years, but there is ample evidence to show that it will ultimately exercise a great beneficial influence on the industry. The number of students sitting for examination under the scheme increases year by year, as the following figures make clear:

1925	108
1926	162
1927	215
1928	254
1929	318

It is not possible to proceed in a revolutionary way. Progress has to be step by step. The next step will probably be the development of arrangements for releasing young men for one or two afternoons a week in order to attend school. This arrangement exists quite commonly in the mechanical engineering industry, but has not yet been found practicable in the gas industry except in one or two instances. There is no doubt, however, that it will ultimately be widely adopted.

Relative Places of Gas and Electricity in Industrial Heating

(Joint Fuel Committee.)

By Sir Robert A. Hadfield, Bart., and R. J. Sarjant.

General Features of Comparison of Gas and Electrical Furnaces.

No hard and fast lines of usefulness can be struck between the two methods of heating, since relative values must depend upon local conditions and the character of the process involved. In general there are numerous industrial operations which may be executed equally well by gas and electricity. Certain common advantages over other forms of heating have already been indicated.

The following distinctions are noteworthy.

Heat Costs.

Gas furnaces are the cheaper in fuel cost, but electric furnaces give the higher thermal efficiency. All forms of gaseous fuel are mostly cheaper than electrical energy when judged merely from the potential heat in the fuel gas as supplied to the furnace. Gas demands a combustion chamber, and in most heating operations, the exhaust products of combustion which must be removed to give place to burning gases, carry away very appreciable proportions of waste heat and reduce the proportion of accessible heat. The recovery of heat from such products is, of course, possible, but it entails special provision of recuperators or regenerators, and while effective means of providing such heat recovery have been devised the heat losses resulting from these auxiliaries must be debited against the furnace. In any case, for the same output the size of the furnace is increased by these provisions. Transformer and other external electrical losses operate against the energy cost with electric furnaces, but such losses are of a much lower order than those indicated above. For a range of operations in which gas furnaces will give thermal efficiencies in the range 18 to 40 p.ct., and only under very favourable conditions higher values, electric furnaces will give 30 to 60 p.ct.

Operation costs are generally in favour of electric furnaces, since they are more readily made automatic in action, and mechanical means of charging and discharging more readily applied.

Maintenance costs are primarily a function of the class of operation and the standard of material and workmanship put into the furnace in the first place. Furnaces which are cheap in first cost are usually expensive in fuel and maintenance costs. A gas furnace, built on sound principles with good quality materials, is very economical in maintenance. In the case of equivalent electrical furnaces there is a higher maintenance cost on auxiliary equipment and resisters; but it must be urged in this respect that electric furnaces are in the infancy of their development, and the potentialities of improvement in this direction are considerable. The scouring action of hot gases and the essential existence of flame has a wearing action on brickwork, particularly in the case of gaseous fuels such as raw producer gas, which carry a fume of suspended ash particles. On the other hand, electric furnaces give no trouble in this respect. For temperatures up to 1000° C., the walls may be constructed in high-grade insulating bricks, in which case the heat required for heating up per unit of chamber surface is considerably reduced. The resulting construction is sufficiently robust for most commercial operations.

Capital charges are higher in the case of electric furnaces, but such charges run in proportion to the degree of complication of construction and provision for high standard of operation and thermal economy. It is not intended in drawing up these distinctions to give the impression that the forms of heating under discussion are acutely competitive for the same operations. Rather should the view be taken that each form has its special suitability for particular uses. The capital charge takes its place with those other considerations, already classed for convenience under the term "adaptability," in regard to which each class of problem must be judged in the light of the local conditions obtaining.

Flexibility.

A gas-fired furnace is the most flexible of all furnaces. Electric furnaces are only flexible within a limited range, though that range may be sufficiently broad to cover many industrial requirements. An electric furnace cannot be forced to the extent possible with a gas furnace, and in general the rate of utilization of heating surface is higher in the fuel-fired furnace. In many metallurgical furnaces, fired by gaseous fuels and used for processes in the temperature range 500°-1000° C., the utilization of heat is in the range of 1½ to 6 B.Th.U. per c.ft. per sec. (13·3 to 53·4 kg. cals. per cub.m. per sec.) of working chamber. A value of 15 B.Th.U. per c.ft. per sec. (134 kg. cals. per cub.m. per sec.) is obtained with good flame mixing in regenerative and recuperative practice for reheating (temperatures 1100°-1200° C.) for rolling and forging. Much higher intensities are obtained with surface combustion amounting to

figures as high as 70-190 B.Th.U. per c.ft. per sec. (623-1691 kg. cals. per cub.m. per sec.) and such intensities are capable of giving high temperatures approaching 1500° C. Figures of this order are practicable in certain types of small electric furnaces with high temperature resisters, but, in general, the values are more of the order of 1 B.Th.U. per c.ft. per sec., and under, for the range 500°-1000° C.

In conclusion, the time-temperature relation of the heating operation largely governs the question of suitability. Thus for short cycle or intermittent operations in batch type furnaces fuel-fired furnaces are more economical. For long soaking treatments under either continuous or batch conditions electric furnaces are particularly suitable.

VALUE OF CONTROL.

Uniform distribution of temperature and close control of rates of heating and final soaking conditions are desired in every heating process. However, as any commercial article advances through its course of manufacture, and successive heating operations are imposed upon it, the value of the product is enhanced, until in the final stages failure becomes increasingly costly. Accordingly, therefore, in such cases the value of accurate heat control is the greater, and it must receive due attention in the heating arrangement. The possibilities of the electric furnace are well known as regards automatic control, uniform distribution of temperature and control of furnace atmosphere made possible by admission of suitable reducing or inert gas. While the case of control of all types of gas-fired furnaces will be readily admitted, it has not been until recently that the subject of automatic control has come to the fore. Experimental inquiry and some commercial utility have, however, long been practised.

PARLIAMENTARY INTELLIGENCE.

[From Our Special Correspondents.]

House of Lords.

Private Bills.

The Brighton and Hove Gas Bill, having been returned from the Commons with the Lords amendments agreed to, has received the Royal Assent.

The Hartlepool Gas and Water Bill has been read a third time, passed, and sent to the House of Commons.

The South Yorkshire and Derbyshire Gas Bill, having received the King's consent, and been reported with amendments from the Committee, has been read a third time, and sent to the House of Commons.

Special Orders.

The following Special Orders are still awaiting consideration by the Special Orders Committee: Colchester; Farnham; Tottenham and District.

House of Commons.

Private Bills.

The Hartlepool Gas and Water Bill has been read a first time, and referred to the Examiners of Petitions for Private Bills.

The Ascot District Gas and Electricity Bill, having been passed by the Committee on Unopposed Bills, has been reported to the House without amendment, and is awaiting third reading.

The Brixham Gas and Electricity Bill has been reported to the House without amendment, and is awaiting third reading.

No Freedom of Choice for the Tenant.

A new clause providing that local authorities shall not impose any term, condition, or restriction with respect to the form of light, heat, power, or energy to be used in any house provided by them was introduced in the House of Commons on Tuesday, July 8, by Mr. W. J. Womersley (Cons., Grimsby) during the consideration of the Housing (No. 2) Bill, as amended in the Standing Committee.

Mr. WOMERSLEY said that a peculiar position had arisen, inasmuch as certain local authorities who owned housing estates had stipulated that those who occupy the houses should only employ, to give power, light, and heat, the medium that they themselves nominated. There was grave alarm in the ranks of the working men engaged in the industry, and he suggested that the tenant should have the right to select the medium of either lighting, heating, or power that he himself desired.

Dr. A. V. DAVIES (Cons., Royton) seconded.

Mr. GREENWOOD, Minister of Health, opposed the clause, which, he said, asked for a limitation of the freedom of local authorities. In regard to 90 p.ct. of the municipal houses which were built in this country, the usual form was to provide electricity for lighting and gas for heating and cooking. It was only in very isolated cases where the local authorities insisted upon the tenants consuming electricity for lighting purposes, and did not allow them the use of gas. In those circumstances, and in view of the fact that local authorities had acted reasonably in the matter, it was most unreasonable to put them under a restriction of this kind, to which they could not tamely submit.

Sir KINGSLEY WOOD (Cons., Woolwich, W.) supported the clause, and said that it was a monstrous piece of tyranny not to allow a tenant to use the kind of heating and lighting he desired.

Capt. D. W. GUNSTON (Cons., Thornbury) said that the cost of electricity supplied by municipalities was not very cheap. The Government was prepared to sacrifice the interests of the workers to worn-out political theories.

Lt.-Col. C. K. HOWARD-BURY (Cons., Chelmsford) said that gas was very much cheaper than electricity for cooking purposes. Was it right that tenants of houses which had been built with public money should be prevented from choosing whether they should have gas or electricity? The prevention of tenants having freedom of choice was almost an infringement of the Truck Acts, which were passed to prevent employers imposing as a condition of employment that their employees should buy from stores run by the employer.

The clause was negatived by 254 votes to 164.

Unopposed Bills.

Two Bills promoted by companies supplying both gas and electricity were considered by the Unopposed Bills Committee of the House of Commons on Wednesday, July 9, and were ordered to be reported for third reading. The Rev. H. Dunnico was in the chair. (Both these Bills have already passed the House of Lords.)

Brixham Gas and Electricity Bill.

The first Bill was that promoted by the Brixham Gas Company, two of the objects of which are to consolidate and convert the Company's capital and to give power to raise additional capital to the extent of £20,000. (See "JOURNAL" for Feb. 5, p. 316.) It is proposed also to alter the name of the Company to "The Brixham Gas and Electricity Company," to extend the limits for the supply of electricity to include a part of the urban district of Paignton, and to revoke the powers which the Paignton Electric Light and Power Company, Ltd., now possesses for the supply of that added area.

The promoters were represented before the Committee by Mr. E. CAMPBELL COOPER (of Messrs. R. W. Cooper & Sons, Parliamentary Agents), who drew attention to some of the clauses which had been added to the Bill. The purpose of one of these clauses was to enable the Company to borrow money on debentures, under the provisions of the Gas Undertakings Act, 1929. Mr. Cooper explained that the Board of Trade had held that a gas company possessing an electricity undertaking was not a gas company within the meaning of the 1929 Act; it became necessary, therefore, to take special power in the Bill to make it a gas company within the meaning of that Act.

With regard to the raising of capital, he said that a clause had been added to the Bill in order to give the Company power to offer capital for subscription and to pay commission in respect of its sale. It had been found difficult to raise capital under the provisions of the Auction Clauses, he said, especially in the case of small companies such as this, because, as the result of their efforts to raise capital by auction locally, the market for raising it in other directions was spoiled. The new clause inserted in the Bill would enable the Company to avoid the Auction Clauses and to raise capital *en bloc* on commission, but only with the approval of the Board of Trade and subject to such conditions as the Board might think fit to impose—and the Board was quite satisfied with the clause

Ascot District Gas and Electricity Bill.

The second Bill which the Committee approved of was that of the Ascot District Gas and Electricity Company, which proposes to authorize the raising of additional capital to the extent of £40,000, applicable to the gas or the electricity undertaking. (See "JOURNAL" for Feb. 5, p. 316.) The Bill contains the same clause as that included in the Brixham Bill, giving power to offer new shares or stock for subscription and to pay commission, subject to the approval of the Board of Trade and to such conditions as the Board may make. There is also a number of general clauses concerning the supply of gas and electricity, which bring the Company's legislation up-to-date.

Mr. ARTHUR J. LEES (Messrs. Lees & Co., Parliamentary Agents) drew the attention of the Committee to a report on the Bill, made by the Minister of Transport, in which report reference was made to a clause by which the Company sought power to recover costs incurred in cutting off supplies of gas or electricity, as rendered necessary by an act, omission, or default on the part of a consumer, and the costs of subsequent re-connection. The comment of the Minister of Transport was that the Electricity (Supply) Act, 1926, already gave power to recover the costs of re-connection of an electricity supply. The Company, however, said Mr. Lees, was supplying both gas and electricity, and sought power not only to recover the costs of re-connection of electricity supplies, but the costs of cutting off and re-connecting supplies of both gas and electricity. At present the Company has no power to recover the costs of cutting off or re-connecting supplies of gas, and, so far as he knew, it has not power to recover the costs of cutting off electricity supplies. The provision asked for by the Ascot Company had been granted two years ago—and two years after the passing of the Electricity (Supply) Act, 1926—to the Yorktown and Blackwater Gas and Electricity Company, which supplied in an adjoining area, and, in view of the circumstances, he asked the Committee to grant the clause to the Ascot Company.

The Committee raised no objections to the insertion of the clause.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

A somewhat brighter tone prevailed on the Stock Exchange last week. In many quarters there is an anticipatory feeling of better things to come in the near future; and there is no doubt that the Bankers' resolution on the Empire Free Trade policy helped considerably towards this end.

Although there was no expansion in the volume of business, the Gas Market continued its normal steady course, and it will be seen from the Stock and Share List that transactions in several securities were recorded at prices slightly above those of the previous week. There were three important increases in the quotations—viz., Gas Light £1 units with a rise of 3d. to 19s. 3d., Liverpool ordinary ½ to 91½, and, at the local Exchange, Newcastle ordinary (to which we referred last week) recovered the set-back of 4½d., and now stands at 16s. 4½d. Those companies operating abroad were the sufferers. Bombay £1 shares dropped 6d. to 17s.; European £10 shares fell ½ to 12; and Montevideo lost 2 points to 107½.

That there is ample demand for gas securities is evidenced by the fact that dealings commenced last week in the South Metropolitan recent issue of Debenture Stock at ½ to ¾ premium, and that the Oxford Company's issue of 6 p.ct. redeemable preference stock was more than three times over-subscribed, the prices ranging from £105 down to the minimum of par. The average price obtained was £101 15s. 6d. p.ct.

An item of interest to gas investors is the contents of a notice which appeared in the "Times" yesterday of a provisional agreement which has been entered into between two of the three Metropolitan companies—viz., the Commercial Gas Company and the South Metropolitan Gas Company. The agreement is subject to the approval of the proprietors and the Board of Trade, and provides for the exchange of stocks and for the Commercial Company to have the benefit of any premises, plant, organization, operations, or other facilities of the South Metropolitan Company in relation to the manufacture and sale of gas. The full text of the notice appears elsewhere in this issue.

Coal Markets.

The coal situation remains unchanged, and is generally considered to be worse than for a long time past. There is a complete absence of demand either for prompt or forward coal, and no sign of improvement in any direction. Continental producers are equally affected, and prices are being cut to obtain any small orders that come along. A recent example is the Athens Gas-Works contract, which frequently goes to Durham. On this occasion it has been given to Russian and Turkish coals, although Durham offers were based on the low figure of 12s. 9d. f.o.b. Another inquiry was for 80,000 tons for the Utrecht Gas-Works. Here again none of the order is coming here, Dutch coals having been contracted for on this occasion. In the week ended July 5, there was a drop of over 100,000 tons in shipments, as compared with the corresponding 1929 week, from the L.N.E.R. staithes on the Tyne, and this is only one section of the river loadings.

Durham gas coals have been a particularly weak feature during the past week, and the superior brands have been unable to hold their prices. Wear specials are now quoted at 15s. 3d. to 15s. 6d. f.o.b., and best qualities 14s. 9d. to 15s. Seconds are 12s. 9d. to 13s. 3d. Good coking sorts are easily obtainable at 13s. Yorkshire, and indeed all the markets, report weakness and short time working, both home trade and export conditions being utterly depressed.

Gas coke is probably the most encouraging feature of any. Requirements for domestic use are expanding, especially on the Continent, and inquiries for the winter season hold out every promise of good trade. The price is maintained at round 21s. 6d.

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 14.

The market for tar products is very quiet at present, and prices quoted are unchanged; pitch being called 47s. 6d. per ton f.o.b. and creosote for the United States 6d. to 6¼d. per gallon f.o.b.

The demand for white spirits is fairly good; pure toluole being 2s. 2d. to 2s. 3d. per gallon, and pure benzole 1s. 10d. to 1s. 11d. per gallon.

The demand for road tar has been extremely good for the last two months, and in consequence the stocks of pitch and oil will not have increased so much as usual during the summer months.

Tar Products in the Provinces.

July 14.

The average prices of gas-works products during the week were: Gas-works tar, 20s. to 24s. Pitch—East Coast, 46s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 46s. f.o.b.* Toluole, naked, North, 1s. 7¼d. to 1s. 8¼d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 1s. to 1s. 0¼d. Creosote, in bulk, North, liquid and salty, 3¼d. to 3¾d.; low gravity, 1¼d.; Scotland, 3¼d. to 3¾d. Heavy oils, in bulk, North, 5¼d. to 6d. Carbolic acid, 60's, 2s. to 2s. 1d. July/December. Naphthalene, £12 to £14. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum, 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port, it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *July* 12.

There is no alteration to report in bye-products this week. Prices remain weak, and with the approaching holidays no alteration can be expected for some time.

Pitch.—The nominal values remain unchanged at about 47s. 6d. per ton f.o.b. Glasgow for export and about 47s. 6d. per ton f.o.r. makers' works for home trade.

Tar.—The production continues on a large scale, but makers' quotations are steady at 3¼d. to 3¾d. per gallon filled into buyers' barrels f.o.r. works.

Creosote.—There is a limited demand for low gravity oils, but other grades remain very quiet. B.E.S.A. specification is 3½d. to 4d. per gallon; low gravity, 3d. to 3½d. per gallon; neutral oil, 3d. to 3¼d. per gallon—all free on rails works in bulk quantities.

Cresylic.—Orders are scarce for all grades. Pale 97/99 p.ct. is 1s. 8d. to 1s. 9d. per gallon; dark 97/99 p.ct., 1s. 7d. to 1s. 8d. per gallon; and pale 99/100 p.ct., 1s. 10s. to 1s. 11d. per gallon—all *ex* makers' works.

Crude naphtha is steady at 4¼d. to 4¾d. per gallon f.o.r. works.

Solvent naphtha is unchanged at 1s. 2¼d. to 1s. 3½d. per gallon for 90/160 grade and 1s. to 1s. 1d. per gallon for 90/190 grade.

Motor Benzole.—While new business is scarce quotations remain steady at 1s. 6¼d. to 1s. 6¾d. per gallon.

Pyridines.—90/140 is 3s. 6d. to 3s. 9d. per gallon; 90/160, 3s. to 3s. 3d. per gallon; 90/180, 2s. to 2s. 3d. per gallon; and 90/220, about 1s. to 1s. 6d. per gallon.

Benzole Prices.

The following are considered to be the market prices at the present time:

	s. d.	s. d.	
Crude benzole	0 10	to 0 11	per gallon at works
Motor ,,	1 5½	,, 1 6½ ,, ,, ,,
Pure ,,	1 10	,, 1 11 ,, ,, ,,

Overseas Opportunities.

[From the Board of Trade Journal.]

Canada.

Cast-Iron Pipe.—A well-known firm of manufacturers' agents in Winnipeg desire to obtain the representation of a British manufacturer of cast-iron pipe, on a commission basis, throughout Western Canada. Manufacturers can obtain further particulars on application to the Department of Overseas Trade, 35, Old Queen Street, S.W. 1. (Ref. No. 20.)

Contracts Advertised To-Day.

Coal.

The Gas Committee of the Clitheroe Corporation invite tenders for the supply of coal. [Advert. on p. 164.]

The Gas Committee of the Sutton-in-Ashfield Urban District Council invite tenders for the supply of coal. [Advert. on p. 164.]

Trade Notes.

"A.W.P." Special Alloying Electrodes.

Alloy Welding Processes, Ltd., of Ferry Lane Works, Forest Road, Walthamstow, E. 17, have published a bulletin entitled "Special Alloying Electrodes," which deals with electrodes for the welding of corrosion and heat-resisting steels.

Cambridge Instruments for Hydrogen-ion Measurements.

The Cambridge Instrument Company, Ltd., of 45, Grosvenor Place, S.W. 1, have recently published a new list (No. 108) describing the apparatus which the firm manufacture for use in connection with the electrometric measurement of hydrogen-ion concentrations.

Success of "The Welder."

Messrs. Alloy Welding Processes, Ltd., of Ferry Lane Works, Forest Road, Walthamstow, E. 17, announce that owing to the reception which "The Welder" has met with, it has been decided that from September onwards the publication will be issued monthly instead of bi-monthly. The proprietors will be pleased to send a copy to any of our readers who are interested.

The Protection of Pipelines.

A well-produced and attractive booklet has recently been published by Messrs. Wailes Dove Bitumastic, Ltd., of Collingwood Building, Newcastle-upon-Tyne, dealing with "bitumastic" solution and enamel for the protection of pipelines. Accompanied by a number of photographs of typical cases where the process has been successfully adopted, the subject matter of the booklet tells something of the conditions which must be considered in the laying of a pipeline, some of the causes of corrosion, and the measures taken for the protection of various types of mains.

The "No-Battery" Torch.

A new type of torch which requires no battery has recently been brought out by Messrs. Cunliffe, Hillstead, MacDonald, and Co., Ltd., of 6, Duke Street, St. James's, S.W. 1, which has been tested and found satisfactory by the Mines Department of the Board of Trade. The torch is worked on the principle of dynamo and springs, and the light produced is sufficient, it is claimed, to allow of a newspaper being read at 40 ft. from the source. The torch is particularly suitable for use in any atmosphere containing explosive vapour and air, as, owing to its construction, there is no danger of sparks.

An Amalgamation.

Practically the whole of the issued shares of Alloy Welding Processes, Ltd., of Ferry Lane, Walthamstow, E. 17, have been purchased by Messrs. Murex, Ltd., who possess works at Rainham, Essex, and whose business is the treatment of complex ores and the manufacture of various alloys and of carbon-free metals. Messrs. Murex, Ltd., own all the share capital of the Premier Electric Welding Company, Ltd., and also that of Thermit, Ltd. The works of the Premier Electric Welding Company, Ltd., will shortly be removed to the works of Alloy Welding Processes, Ltd., as the latter Company have ample space to accommodate them in their new factory, of which they only took possession about eighteen months ago.

Extensions at Meltham.

To meet the increased demands for gas, the Meltham Gas Department are extending their horizontal retort bench, and the retort house and roof. The complete order has been entrusted to Messrs. Robert Dempster & Sons, Ltd., Elland. The producer is fitted with the well-known non-clinkering inclined screen-bar grate, and the regenerators are built from machine-made close-grained firebrick tubes in staggered cellular formation. The tubes being back-to-back and horizontally disposed, the following conditions are established: Full accessibility and visibility to all flues both S.A. and W.H.; conditions of combustion brought into observation; straight flues for easy cleaning; divide between S.A. and W.H. The divide can be inspected and repaired on both sides—all being features conducive to high efficiency working over the long period of years.

Gas Acts (1920 and 1929) Orders.

SECTION 1.

Great Grimsby Gas Company.

The standard and maximum prices now authorized in respect of the supply of gas are 12·8d. and 14d. per therm respectively, and the prices which the undertakers have asked the Board of Trade to substitute for these are 11·4d. and 12·6d. per therm.

Midsomer Norton Gas and Coke Company, Ltd.

To authorize the Company to borrow any sum not exceeding the aggregate amount of the paid-up share capital of the undertaking for the time being and of any premiums in respect thereof.

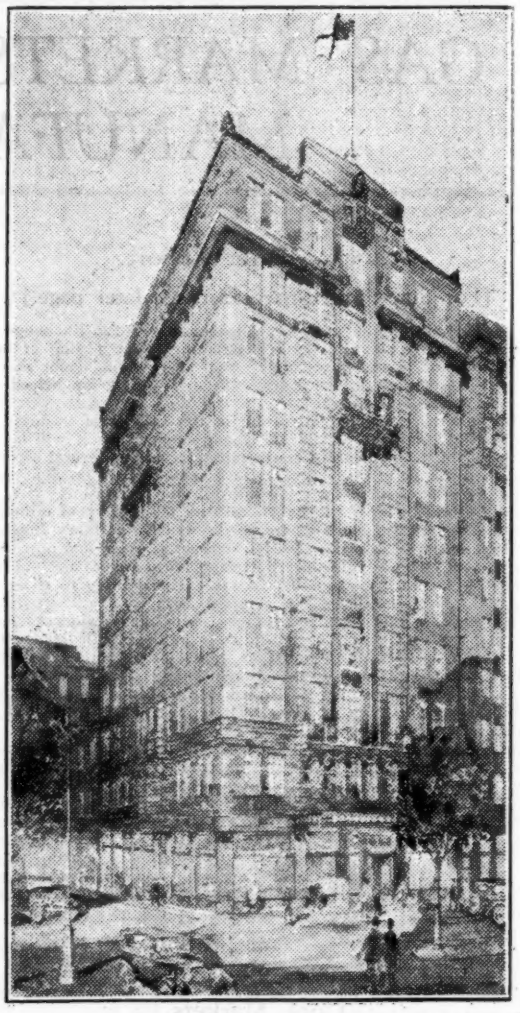
DECLARATIONS OF CALORIFIC VALUE.

Chapel Whaley and District Gas Company.—450 B.Th.U. (Oct. 1.)

Highbridge Gas Company, Ltd.—475 B.Th.U. (Sept. 1.)

Little Hulton Urban District Council.—480 B.Th.U., in substitution for 500 B.Th.U. (Oct. 11.)

Gas in Melbourne's Highest Building.



Our photograph shows the Vaughan office building in Melbourne, at the corner of Queen Street and Little Collins Street. It is the highest building allowed by the City Authorities. The main heating is by means of "St. Andrew" gas-steam radiators, made by Messrs. John Wright & Co. (Radiation, Ltd., proprietors).

City and Guilds of London Institute.

Technological Examinations, 1930.

The following questions were set in the Final Examination in

COKE AND BYE-PRODUCTS MANUFACTURE.

May 7, 7 to 10 p.m.

(The maximum number of marks obtainable is affixed to each question. Not more than eight questions to be attempted.)

1. (*a*) Discuss the trend of design of the modern coke oven, and (*b*) Describe any particular type. (40.)

2. A coking plant desires to blend three coals of different properties. Explain how this may be done, illustrating with sketches the layout. (40.)

3. Write a short essay on the recovery of sulphur from coke oven gas, with special reference to liquid processes. (45.)

4. Discuss the use of coke oven gas for purposes other than heating the ovens themselves, and describe methods for the removal of naphthalene and water. (45.)

5. Write an account of the methods of recovery of crude benzole, explaining briefly the principles involved, the necessary plant, and the laboratory control. (35.)

6. Sketch and explain the working of one of the following:
   (*a*) A CO_2 recorder.
   (*b*) A coal crusher.
   (*c*) A collecting main pressure regulator. (35.)

7. How would you evaluate a sample of coal as to its suitability for the manufacture of coke and its usual bye-products? (40.)

8. Describe the nature and properties of the refractory lining used in a modern coke oven. How would you ascertain the suitability for this purpose of a sample of such a material? (35.)

9. Describe the construction of a plant for the manufacture of sulphate of ammonia, paying special attention to the materials used. Give the specification for "dry neutral sulphate." (35.)

10. Write an essay on the cleaning of coal preparatory to coking, making reference to any recent developments. (40.)

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. July 11.	Rise or Fall on Week.	Transact'ns Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 6	5	5	Aldershot 5 p.c. max. C. .	73–78	..	..
522,992	,,	,,	4	4	Do. 4 p.c. Pref. . .	70–73	..	..
1,551,868	,,	Apl. 3	7⅜	7⅜	Alliance & Dublin Ord. . .	93–96	..	93–93⅜
374,000	,,	July 10	4	4	Do. 4 p.c. Deb. . .	60–63*	..	..
522,655	,,	Mar. 6	7	7	Barnet Ord. 7 p.c. . . .	109–112	..	..
300.000	1	Apl. 24	1/4⅛	1/7⅛	Bombay, Ltd.	16/- - 18/-	—/6	16/3—17/-
174,500	10	Mar. 6	9	9	Bournemouth 5 p.c. . . .	14–15	..	..
500.050	10	,,	7	7	Do. B 7 p.c. . .	12½–12⅝	..	..
439.160	10	,,	6	6	Do. Pref. 6 p.c. .	10½–11½	..	..
50,000	Stk.	June 26	3	3	Do. 3 p.c. Deb. .	54–57	..	..
162,025	,,	,,	4	4	Do. 4 p.c Deb. .	72–75	..	..
357,900	,,	Mar. 20	7½	7½	Brighton & Hove 6 p.c. Con.	114–117	..	115½
871,880	,,	,,	6½	6½	Do. 5 p.c. Con.	102–105	..	..
1,287 500	,,	Feb. 20	5	5	Bristol 5 p.c. max.	89–90a	..	..
855,000	,,	Apl. 8	7	8	British Ord.	110–115	..	..
100,000	,,	June 26	7	7	Do. 7 p.c. Pref.	112–117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	70–73	..	..
450 000	,,	,,	5	5	Do. 5 p c. Red. Deb. .	90–93	..	..
100.000	,,	June 26	5	5	Cambridge 5 p.c. Deb. . .	93–96	..	..
100.000	10	May 22	6	10	Cape Town, Ltd	9–10	..	..
100.000	10	Apl. 24	4½	4½	Do. 4½ p.c. Pref. . .	6½–7½	..	..
150,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. . .	69–74	..	..
626,860	,,	Feb. 20	6	6	Cardiff Con. Ord.	96–99	..	..
237.860	,,	June 26	7½	7½	Do. 7½ p.c. Red. Deb. .	97–100	..	..
157,150	,,	Feb. 20	5	5½	Chester 5 p.c. Ord. . . .	88–93b	..	..
98.936	1	May 8	†2/-	†2/-	Colombo, Ltd. Ord. . . .	33/—35/-	..	..
24 500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. .	18/6–20/6	..	..
375,402	1	Apl. 3	1/9½	1/9½	Colonial Gas Assn. Ld. Ord	18/—20/-	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	19/—21/-	..	..
2,073,280	Stk.	Feb. 20	5	7	Commercial Ord.	90–93	..	..
475,000	,,	June 26	3	3	Do. 3 p.c. Deb. . .	56–59	..	..
787,560	,,	Feb. 20	7	7	Croydon sliding scale . .	105–108	..	..
453,100	,,	,,	5	5	Do. max. div. . . .	83–86	..	..
542 270	,,	Mar. 6	7	10	Derby Con.	115–125e	..	..
55,000	,,	June 26	4	4	Do. Deb.	65–70e	..	..
209.000	,,	Mar. 6	5	5	East Hull Ord. 5 p.c. . . .	71–73	..	..
1,002,180	10	Mar. 20	†4	†7	European, Ltd.	11–13	—½	11—11½
18,628,125	Stk.	Feb. 20	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	19/—19/6f	+-/3	19/—19/6
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max. . . .	63½–65½	..	64⅜
4,157.020	,,	,,	4	4	Do. 4 p.c. Con. Pref. . .	77–80	..	77⅞–79
5.502,620	,,	June 26	3	3	Do. 3 p.c. Con. Deb. . .	58–61	..	58⅞–60⅜
2,542,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. . .	97–100	..	100
161,480	,,	Feb. 20	10	10	Harrogate Cons. 10 p.c. max.	158–163	..	..
82,500	,,	Mar. 20	7	7	Hastings & St. L. 5 p.c. Conv.	99–104	..	103½
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	78–83	..	..
70 000	10	May 22	†10	1	Hongkong & China, Ltd. .	13½–14½	..	..
213,200	Stk.	Mar. 6	6	6	Hornsey Con. 3½ p.c. . . .	90–93	..	..
2.436,594	,,	May 22	10	25	Imperial Continental Cap. .	840–860	..	883—859
228,180	,,	Feb. 6	3¼	3½	Do. 3½ p.c. Red. Deb.	80–85	..	80
235,242	,,	Mar. 20	8½	8½	Lea Bridge 5 p.c. Ord. . .	123–128	..	..
2,145.907	,,	Feb. 20	6	6	Liverpool 5 p.c. Ord. . . .	92–93b	+½	..
600 000	,,	Mar. 20	7	7	Do. 7 p.c. Red. Pref. .	100–102b	..	..
165,736	,,	Feb. 20	9	8	Maidstone 5 p.c. Cap. . .	119–124	..	..
68,480	,,	June 26	3	3	Do. 3 p.c. Deb. . . .	51–54	..	..
75,000	5	June 26	†10	110	Malta & Mediterranean . .	5½–6	..	..
392,000	—	Apl. 1	5½	5½	Metrop'itan (of Melbourne) 5½ p.c. Red. Deb. . . .	90–93	..	..
541,920	Stk.	May 22	†6	†8	Montevideo, Ltd.	105–110	—2	106½
2,061,315	,,	Feb. 20	5	5½	Newcastle & Gateshead Con.	16/—16/9d/f	+-/4½	..
682,856	,,	,,	4	4	Do. 4 p.c. Pref. .	72–78d	+½	..
691,705	,,	Dec. 19	3½	3½	Do. 3½ p.c. Deb. .	66⅞–67¾d	..	..
169,940	,,	Mar. 6	7¼	7½	North Middlesex 6 p.c. Con.	109–114	..	..
396,160	,,	Feb. 6	5	5	Northampton 5 p.c. max. .	75–78	..	..
300 000	,,	Apl. 24	9	7	Oriental, Ltd.	108–113	..	..
60.000	5	13 My., '15	—	—	Ottoman	0–¼	..	..
205,162	Stk.	June 26	8	8	Plym'th & Stonehouse 5 p.c.	105–108	..	..
424,416	,,	Feb. 20	8	8	Portsm'th Con. Stk. 4 p.c. Std	110–115	..	112
241.446	,,	,,	5	5	Do. 5 p.c. max. . .	78–81	..	78
186,000	100	June 2	4	4	Primitiva 4 p.c. Red. Deb. .	96–99	..	97½–98
677,837	Stk.	Jan. 23	4	4	Do. 4 p.c. Red. Deb. 1911	81–84	..	..
371.496	,,	June 26	4	4	Do. 4 p.c. Cons. Deb. .	79–82	..	..
150,000	10	Apl. 3	6	6	San Paulo 6 p.c. Pref. . .	8½–9	..	..
1.736.968	Stk.	Mar. 20	6½	6½	Sheffield Cons.	103–105e	..	..
95,000	,,	July 10	4	4	Do. 4 p.c. Deb.	76–78e*	..	..
90 000	10	June 5	†4	‡	South African	4–6	..	..
8 709.895	Stk.	Feb. 20	5	7½	South Met. Ord.	102–104	..	102½–103½
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	108–111	..	110½
1,895.445	,,	July 10	3	3	Do. 3 p.c. Deb. . . .	57–60*	—1	..
734.000	,,	Mar. 6	6½	6½	Do. 6½ p.c. Red. Db.	99–101	..	100—100½
91.500	,,	Mar. 20	8½	8½	South Shields Con. . . .	106½–107½d	..	..
1,543,795	,,	Feb. 20	6½	6½	South Suburban Ord. 5 p.c.	101–104	..	..
468,887	,,	June 26	5	5	Do. 5 p.c. Deb.	93–96	..	..
647.740	,,	Feb. 20	5	5	Southampton Ord. 5 p.c. max.	76–79	..	77½–78½
121.275	,,	June 26	4	4	Do. 4 p.c. Deb.	71–74	..	..
179,014	,,	Feb. 20	8	8	Sutton Ord.	113–116	..	..
67,828	,,	June 26	5	5	Do. 5 p.c. Deb. . . .	93–96	..	..
250.000	,,	Mar. 6	7	7	Swansea 7 p.c. Red. Pref. .	98–100	..	99
200,000	,,	June 26	6½	6½	Do. 6½ p.c. Red. Deb. .	97–100	..	99
1,076,490	,,	Mar. 6	6⅝	6⅝	Tottenham District Ord. .	102–106	..	..
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. . .	97–100	..	..
199.005	,,	June 26	4	4	Do. 4 p.c. Deb. . .	73–76	..	..
182,380	10	30 Dec., '12	—	—	Tuscan, Ltd.	3½–4½	..	..
85,701	Stk.	Mar. 20	6	6	Do. 6 p.c. Red. Deb.	75–80	..	..
309,094	,,	Mar. 6	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	94–99	..	..
88,390	,,	,,	5	5	Do. 5 p.c. pref. . .	85–90	..	..
1,180,970	,,	July 10	—	7	Wandsworth, Wimbledon, and Epsom Cons. . .	105–110*	—3	.
200,000	,,	,,	5	5	Do. 5 p.c. Pref.	87–90*	—2	..
488,344	,,	June 26	5	5	Do. 5 p.c. Deb.	93–96	..	..

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle. e.—Sheffield. f.—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year. § Div=10 p.ct. p.a. less tax and less tax on interim dividend.

A LONG FELT WANT

GENERAL

IMMERSION INDIRECT WATER HEATER

Works with Existing Hot-Water Systems.

HARD AND SOFT WATER TROUBLES DISAPPEAR!

NO CONDENSATION
NO CORROSION OF INTERNAL FLUES
NO DISCOLORATION OF WATER
NO DEPOSIT IN THE FLUE
NO DEPOSIT IN THE BOILER
LAGGING—VERMIN PROOF

Illustrated List on Application to

GENERAL GAS APPLIANCES LIMITED

Guide Bridge Manchester

INDEX TO "JOURNAL" ADVERTISERS.

	PAGE
Aerograph Co., Ltd.	120
Alder & Mackay, Ltd.	Wrapper I., 119
Aldridge & Ranken, Ltd.	—
Allan, Thomas, & Sons, Ltd.	166
Anglo-American Oil Company, Ltd.	168
Arden Hill & Co.	—
Armco International Corporation.	—
Asbestos Cement Building Products, Ltd.	—
Ashmore, Benson, Pease, & Co., Ltd.	Wrapper I.
Ashwell & Nesbit, Ltd.	—
Bagnall, John, & Sons, Ltd.	—
Bagshawe & Co., Ltd.	—
Bale & Church, Ltd.	163, 168
Barclay, Andrew, Sons, & Co., Ltd.	—
Barrowfield Ironworks, Ltd.	—
Bell's Poilite & Everite Co., Ltd.	—
Berk, F. W., & Co., Ltd.	Wrapper I.
Blakeley (Firth), Sons, & Co., Ltd.	164
Braddock, J. & J.	Centre IX., 163
Bray, George, & Co., Ltd.	—
British Aluminium Co., Ltd.	—
British Fibrocement Works, Ltd.	—
British Furnaces, Ltd.	169
British Gas Purifying Materials Co.	163
British Thomson-Houston Co., Ltd.	120
Broadbent, Thos., & Son, Ltd.	116
Broadhead Constructions, Ltd.	—
Bugden, T., & Co.	168
Cambridge Instrument Co., Ltd.	—
Cannon Iron Foundries, Ltd.	125
Carless, Capel, & Leonard	—
Carron Company	—
Cellactite & British Uralite, Ltd.	—
Celite Products Corporation	—
Chapman (Spencer) & Messel, Ltd.	163
Chemical Engineering and Wilton's Patent Furnace Co., Ltd.	163
Clapham Bros., Ltd.	
Clayton, Son, & Co., Ltd.	173
Cloake, A. G.	—
Coleman Foundry Equipment Co.	—
Colthrop Board & Paper Mills, Ltd.	118
Cort, Robert, & Son, Ltd.	124
Cowan, W. & B.	Wrapper III.
Crossley Bros. (Bispham)	—
Crossley Brothers, Ltd. (Openshaw).	—
Cutler, Samuel, & Sons, Ltd.	Centre IX.
Dampney, J., & Co., Ltd.	—
Danks, H. & T. (Netherton), Ltd.	163
Davis Gas Stove Co., Ltd.	127
Davison & Partner, Ltd.	—
Dempster, R. & J., Ltd.	Wrapper I.
Dempster, R., & Sons., Ltd.	Centre II., 164
Donkin Co., Ltd. (The Bryan)	Wrapper II.
Dougall's Gas Meters, Ltd	—
Drakes, Ltd.	—
Drayton Regulator and Instrument Co., Ltd.	—
Dry Gasholders, Ltd.	—
Duckham, Alexander, & Co., Ltd.	—
Duxbury, Thomas, & Co.	163
Eagle Range and Grate Co.	—
Economic Gas Boiler Co., Ltd.	121
Economical Gas Apparatus Construction Company, Ltd.	—
Eden Fisher & Co., Ltd.	—
Ellis, Key, & Co.	—
Evans, Joseph, & Son (Wolverhampton), Ltd.	169
Expanded Metal Company, Ltd.	—
Falk, Stadelmann, & Co., Ltd.	—
Fletcher, Russell, & Co., Ltd.	—
Foster & Pullen, Ltd.	166
Foster Bros., Ltd.	—
Fraser & Chalmers Engineering Works	—
Gas Chambers and Coke Ovens, Ltd.	—
Gas Meter Co., Ltd.	Wrapper. IV., 122
Gas Purification and Chemical Co.	Wrapper I., 163
General Gas Appliances, Ltd.	161
General Refractories, Ltd.	—
Gibbons Bros., Ltd.	—
Gibbons (Dudley), Ltd.	—
Gledhill-Brook Time Recorders	167
Glenboig Union Fireclay Co., Ltd.	167
Glover, George, & Co., Ltd.	115
Glover, Thos., & Co., Ltd.	130
Goodall, Clayton, & Co., Ltd.	169
Grant, David, & Co.	169
Green & Boulding, Ltd.	166
Griffin & Tatlock, Ltd.	120
Griffiths Bros. & Co. (London), Ltd.	Wrapper I.
Hall, John, & Co., Stourbridge, Ltd.	170
Hardtmuth, L. & C.	—
Harris & Pearson	167
Head, Wrightson, & Co., Ltd.	—
Heathman, J. H.	—
Hislop, R. & G.	167
Holmes, W. C., & Co., Ltd.	Wrapper I., 165
Holst, K., & Co.	—
Horseley Bridge and Engineering Company, Ltd.	—
Horstmann Gear Company, Ltd	—
Hortonspheres	—
Humphreys & Glasgow, Ltd.	128
Hutchinson Bros., Ltd.	—
Institute of Chemistry	—
Jenkins, W. J., & Co., Ltd.	—
Kaye, Joseph, & Sons, Ltd.	—
Keith, James, & Blackman Company, Ltd.	174
Kent, George, Ltd.	—
King, D., & Son	—
King, Walter, Ltd.	Centre X., 164, 166, 167
King's Patent Agency	—
Kinnell, Chas. P., & Co., Ltd.	121
Kirkham, Hulett, & Chandler, Ltd.	—
Kleenoff Co.	163, 168
Koppers Coke Oven Co., Ltd.	166
Laidlaw, R., & Son (Edin.), Ltd.	172
Le Bas Tube Co., Ltd.	172
Lead Wool Company, Ltd.	168
Lighting Trades Ltd.	—
London Electric Firm, The	—
London Gas Exhibit	—
Macpherson, Donald, & Co., Ltd.	—
Main, R. & A., Ltd.	Centre VII.
Manchester Oxide Co., Ltd.	163
McKelvie, James, & Co.	Wrapper I.
Metropolitan Vickers Electrical Co., Ltd.	—
Mewburn, Ellis, & Co.	163
Midland Flexible Metallic Tubing Co., Ltd.	—
Mitchell, H., & Co.	—
Mobberley & Perry, Ltd.	—
Moler Products, Ltd.	—
New Conveyor Co., Ltd.	170
Newton Chambers & Co., Ltd.	Centre VI.
Orme, George, & Co.	—
Oughtibridge Silica Firebrick Co.	123
Parkinson Stove Co., Ltd.	Centre III.
Parkinson, W., & Co.	118, 130
Patent Retorts, Ltd.	166
Pearson, E. J. & J., Ltd.	—
Peckett & Sons, Ltd.	170
Peebles & Co., Ltd.	—
Penney & Porter, Ltd.	—
Perfecta Meters, Ltd.	—
Phillips, J. W. & C. J., Ltd.	166
Piggott, Thos., & Co., Ltd.	126
Pneumatic Conveyance and Extraction (1929), Ltd.	122
Pocock, Herbert	—
Potterton, T. (Heating Engineers), Ltd.	—
Premier Gas Engine Co., Ltd.	—
Progas Co., Ltd.	—
Pulsometer Engineering Company	Wrapper IV.
Purimachos Ltd.	—
Quasi-Arc Co., Ltd.	—
Radiation Ltd.	Centre IV., V., 127
Raschig, Dr. F., G.m.b.H.	—
Reavell & Co., Ltd.	171
Renold, Hans, Ltd.	—
Richmonds Gas Stove Co., Ltd.	—
Riley, A. J., & Sons, Ltd.	—
Riley, John, & Sons, Ltd.	—
Robinson, J. H., & Co. (L'pool), Ltd.	126
Ross, Chas., Ltd.	163
Rotary Meter Company, Ltd.	—
Rotherham and District Collieries Association, Ltd.	Wrapper IV.
Ruscoe, John, & Co., Ltd.	170
Sawer & Purves	Centre XI.
Scottish Tube Co., Ltd.	173
Sheepbridge Coal and Iron Co., Ltd	Wrapper IV.
Siebe, Gorman, & Co., Ltd.	167
Simon-Carves, Ltd.	—
Smith Meters, Ltd.	—
Solent Engineering Co., Ltd	—
South Metropolitan Gas Company	Wrapper II.
Spencer-Bonecourt, Ltd.	—
Spencer Chapman & Messel, Ltd.	163
Stanton Ironworks Co., Ltd.	Centre VIII.
Staveley Coal and Iron Co., Ltd.	117
Stein, J. G., & Co., Ltd.	Wrapper I.
Stewarts and Lloyds, Ltd.	Wrapper I.
Strachan & Henshaw, Ltd.	115
Stringer Bros.	—
Sugg, Wm., & Co., Ltd.	—
Super-Centrifugal Engineers, Ltd.	—
Sweet & Maxwell, Ltd.	166
Taylor, Joseph (Saturators), Ltd.	—
Thames Bank Iron Co., Ltd.	—
Thompson, J. (Wolverhampton), Ltd	—
Tilghman's Patent Sand Blast Co.	—
Tilley Bros., Ltd.	129
Torbay Paint Company, Ltd.	Wrapper I.
Trier Bros., Ltd.	—
Trotter, Haines, and Corbett, Ltd.	166
Tully Sons & Co., Ltd.	172
Turner Brothers Asbestos Co., Ltd.	—
Turner, F. (Art Metal), Ltd.	—
Vertical Gas Retort Synd., Ltd.	174
Vickery, J. H., & Co., Ltd.	—
Wailes Dove Bitumastic, Ltd.	—
Walker, C. & W., Ltd.	Centre X.
Waller, Geo., & Son, Ltd.	116
Walworth, Ltd.	—
Waterless Gasholder Co., Ltd.	—
Wellington Tube Works, Ltd.	—
Welsbach Light Company, Ltd.	—
West's Gas Improvement Co.	Centre XII.
Westwood & Wrights	—
Whessoe Foundry and Eng. Co., Ltd.	—
Wholesale Fittings Co., Ltd.	—
Willey & Co., Ltd.	—
Williamson, Cliff, Ltd.	—
Willmott, A. R., & Co.	—
Wilson (George) Gas Meters, Ltd.	163
Wilsons & Mathiesons, Ltd.	—
Winn, Paul, & Co., Ltd.	123
Woodall-Duckham Co., Ltd.	Centre I.
Woolley, James, Sons & Co., Ltd.	—
Wright, Alex., and Co., Ltd.	Centre XI.
Wright, John, & Co.	—

Appointments Vacant & Wanted	163, 164
Company Notices	—
Contracts Open	164
Educational	—
Gas-Works for Sale	—
Patent Notices, &c.	164
Plant, &c., for Sale and Wanted	164
Stock Issues	—

CONTENTS

EDITORIAL NOTES.

A GLANCE AT THE CONTENTS . . 193
Gas Fires and Summer Heat 194
Electrical Competition 194
Do It Now 194
John Bull's Shop 194
The New London Gas Agreement 195
. . . With My Little Eye 195
The New Spirit—Co-Partnership in Gas—What Nine Years Show 195
Cold Weather and Gas Bills—A Hundred Years Ago 196

Personal 196
Obituary—
Leonard Körting 196
Forthcoming Engagements 196
On the Electrical Side 197

CORRESPONDENCE.

Correspondence Classes 197

THE NEWS OF THE WEEK.

New Showrooms at Whitchurch—Evesham Rural District Council—Oswestry Gas-Works—North British Association of Gas Managers—A Successful Bread Baking Competition—National Mark Week—Cheaper Gas for Market Harborough—Electrical Cooking Apparatus Too Expensive—First Volume of "The Welder"—Tottenham and District Gas Company's Dividends—A Bogus Gas Meter Inspector—Uppingham Gas Company's Dividend . 198

THE NEWS OF THE WEEK—(*continued*).

Promotion of Exhibitions—Opposition to the Erection of a Gasholder—To Help Housewives 199
South Suburban Gas Company Co-Partnership Festival 199
Keith-Blackman Week of Social Events . . 199
Merchandise Marks Act, 1926 200
Lighting Conference 200
Terms of the Southend Amalgamation . . 200
Notes from Scotland 200
Corporation Undertakings' Results . . . 201

Profits Spent on Plant and Income-Tax . . 202
Steel Mains and Corrosion. By E. E. Jeavons, M.Inst.C.E., and H. T. Pinnock, M.A. (Oxon.), F.I.C. 203

THE "JOURNAL" TECHNICAL RECORD.

Manchester District Institution of Gas Engineers—
Microscopical Examination of Coal, By J. Lomax 205
General Business 206
Luncheon 206
Institution of Gas Engineers—
Reply to the Discussion on Prof. Cobb's Paper 207
Street Lighting. By Prof. Dr. J. Teichmuller 207
Science in the Service of Illuminating Glass Manufacturers. By S. English, D.Sc. . 209

REGISTER OF PATENTS.

Carburetted Water Gas Plant—Humphreys & Glasgow, Ltd. 210
Waterless Holders—Müller, W. 210
C.W.G. Production—Humphreys & Glasgow, Ltd. 210
Gas Producer Grates—Gibbons Bros., Ltd. . 210
C.W. Gas Manufacture—Humphreys & Glasgow, Ltd. 210
Geysers—Ewart, S., Ewart, J. W., and Ewart & Son, Ltd. 211
Lubrication of Meters—Simpson, S., and Willey & Co., Ltd. 211
Meters—Meters, Ltd., and Glover, W. T. . 211
Applications for Patents 211

PARLIAMENTARY INTELLIGENCE.

House of Lords—
Private Bills 211
Special Orders 211
House of Commons—
Private Bills 211
Special Orders 211

Institution of Chemical Engineers—Examination Questions for Associate-Membership . 211

GAS MARKETS AND MANUFACTURES.

Stock Market Report 212
Coal Markets 212
Contracts Advertised To-Day 212
Current Sales of Gas Products 212
Trade Notes 212

Stock and Share List 213

"JOURNAL" Telephone: Central 6055 | For Advertisers' Index—see p. 214.

FERRO-CONCRETE

GAS PURIFIERS
COKE BUNKERS
LIQUOR TANKS
PILED AND RAFT
FOUNDATIONS
ETC.

ENQUIRIES INVITED

K. HOLST & CO.

ENGINEERS & CONTRACTORS
HEAD OFFICE:
1, VICTORIA STREET, LONDON, S.W.1

100%

BRITISH

The

THOMAS GLOVER METER

BUILT AT THE GOTHIC WORKS
EDMONTON. LONDON. N. 18

PARKINSON'S

DRY METERS.

"LIGHTS," "STANDARD,"
OR
"HIGH CAPACITY."

WRITE FOR PRICES

W. PARKINSON & CO.,

INCORPORATED IN PARKINSON & COWAN (GAS METERS), LTD.

COTTAGE LANE, CITY ROAD, LONDON, E.C.1.	BELL BARN ROAD, BIRMINGHAM.	RAPHAEL ST. WORKS, CROMAC STREET, BELFAST.
Telegrams: "INDEX, 'PHONE, LONDON."	"GASMETERS, B'HAM."	"PREPAYMENT, BELFAST."
'Phone Nos.: 4270 Clerkenwell	2245 Midland, B'ham.	3374 Belfast.